

DISSERTATION:

DEVELOPMENT OF A BEHAVIORAL MEASUREMENT OF SENSATION SEEKING
PERSONALITY TRAIT AND ITS ASSOCIATION WITH NEGATIVE HEALTH
OUTCOMES

Submitted by

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ABSTRACT

DEVELOPMENT OF A BEHAVIORAL MEASUREMENT OF SENSATION SEEKING PERSONALITY TRAIT AND ITS ASSOCIATION WITH NEGATIVE HEALTH OUTCOMES

Sensation seeking, a personality trait in which an individual has the tendency to pursue novel and highly stimulating experiences and often engages in risky behaviors to do so, is associated with several negative health outcomes when paired with low cognitive control. These outcomes include higher rates of substance misuse, self-harm, problem gambling, risky sexual behavior, engaging in dangerous sports, and criminal activities. It would be beneficial to have valid ways of measuring the trait to address or prevent these negative health outcomes from occurring. The sensation seeking personality trait is typically only measured using self-report surveys, even though it manifests itself behaviorally. Creation of behavioral measurements of sensation seeking may aid in the understanding of the trait and its behavioral effects, as well as aid in prevention of negative health outcomes. Previous attempts to measure sensation seeking behaviorally have not been successful, potentially due to the inherent nature of the trait being difficult to elicit in standard laboratory tasks and environments, and use of extrinsic rather than intrinsic motivators. I developed two novel emergent behavioral tasks to measure observed changes in participant-driven behavior and related these task variables to each individual's measured sensation seeking personality trait. I also assessed whether these new task measures correlated with reported negative health behaviors that have been associated with sensation seeking. This dissertation consists of three studies utilizing these novel emergent behavioral

tasks. The first compared task measures to self-report measures of sensation seeking and personality traits, the second served as a replication and looked at relations between task measures and risky behaviors, and the third developed a virtual reality variant of the tasks. Several of the behavioral measurements within the emergent behavior tasks showed significant relations with sensation seeking personality trait, in particular measures of risky or “dangerous” decisions made in Studies 1 and 2 that correlated with the risk seeking subtype of sensation seeking personality trait. Study 3 found that implementing the behavioral tasks in virtual reality resulted in weaker, rather than stronger, relationships between the behavioral measures and self-report measures. Together, these studies found that the emergent tasks implemented using standard computer interfaces, but not virtual reality, show promise as valid behavioral measurements of sensation seeking personality trait.

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DEDICATION

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INTRODUCTION

Sensation Seeking Personality Trait

Sensation seeking is a measurable personality trait marked by an individual's preference and drive towards novel and excessively stimulating experiences as well as a propensity to disregard risk to attain them (Zuckerman et al., 1972; Roberti, 2004; Conner, 2022). Sensation seeking has been found to be associated with the dopaminergic midbrain and has effects on reward-based decision making and behavioral strategies (Krebs, Scott, & Düzel, 2009; Noël et al., 2011; Norbury et al., 2016). The dopaminergic midbrain may be a driving force behind those high in sensation seeking having greater motivation and preference for highly stimulating and novel activities, such as recreational drug usage, extreme sports, risky sexual behavior, and other potentially harmful experiences (Roberti, 2004; Chase et al., 2017, Weishaar et al., 2021). High sensation seeking also results in a decrease in goal-directed behavior when alternative, more highly stimulating options are present, and can be a motivator in the absence of explicit rewards (Roberti et al., 2004; Koster et al., 2016). Increased motivation towards highly sensational stimuli may also be responsible for underestimation of the degree of risk in a situation, which can then potentially reduce avoidance of dangerous or risky behaviors (Roberti, 2004; Lissek et al., 2005; Quinn & Harden, 2013).

Sensation seeking personality trait is related to observable behavioral differences in individuals. Individuals low in sensation seeking are more risk-avoidant and report greater anxiety in response to risk, threat, and uncertainty. High sensation seeking individuals are more inclined to engage in risk and may value risk itself as intrinsically rewarding (Zuckerman et al., 1972; Lissek et al., 2005; Huskey et al., 2018; Conner, 2022). This bias towards risk as well as

increased motivation from highly stimulating situations results in an increased preference for potentially risky activities, such as recreational drug use or extreme sports (Roberti, 2004; Norbury & Husain, 2015; Weishaar et al., 2021).

Several attempts to identify the factor structures of sensation seeking have been made (Zuckerman et al., 1972; Arnett, 1994; Conner, 2022). When considering the original definition of sensation seeking, it comprises a focus of the individual's intrinsic motivation towards approaching more exciting or stimulating experiences, as well as a tendency to disregard risk in order to do so (Zuckerman et al., 1972). In this regard and in concurrence with recent understanding in identifying the first order factors of sensation seeking, sensation seeking can be viewed as the overall latent trait, with two primary factors each focusing on aspects of that trait (Conner, 2022). These primary factors are experience seeking, the drive towards novel and exciting stimuli, and risk seeking, the willingness to engage in risk for such experiences (Conner, 2022). While experience seeking can be easily considered as resulting from intrinsic motivation or reward sensitivity towards these inherently more interesting stimuli, it remains unclear whether risk seeking results from intrinsic motivation towards the experience of risk itself or is due to disregard for risk in order to attain such experiences. These factors together may provide the best characterization of the overall personality trait of sensation seeking, and therefore provide the best primary factors on which to predict engagement in the health risk behaviors associated with sensation seeking.

Related Cognitive Constructs to Sensation Seeking Personality Type and Interactions

Cognitive Control

Sensation seeking is frequently considered alongside low cognitive control and novelty seeking as factors impacting the overall downstream behavioral effects of engagement in health

risk behaviors (Bardo, Donohew, & Harrington, 1996; Zimmerman, 2010; Koster et al., 2016). Cognitive control is a component of executive functions responsible for inhibition and is frequently implicated as a factor associated with risky behaviors (MacDonald et al., 2000; Bechara, 2005; Brevers et al., 2012, Gratton et al., 2017). Low cognitive control results in less regulation over impulsivity and impulsive behaviors, resulting in individuals with low cognitive control having difficulty suppressing undesirable behaviors, attending to long term goals, or considering consequences (Zuckerman, 1994; Evenden, 1999; MacDonald et al., 2000; Norbury, 2016). Cognitive control can also be affected by motivation in a task, with increased control being possible when a person is given substantial motivation (Huskey et al., 2018). Cognitive control impairment is also related to real-world negative health consequences, such as an increased risk of substance misuse, problem gambling, and criminal behaviors (Steinberg, 2008; Noël et al., 2011; Brevers et al., 2012). Regarding the negative health outcomes of sensation seeking, cognitive control often acts as a moderator, with individuals who are both high in sensation seeking and low in cognitive control exhibiting riskier behavior and experiencing more negative health outcomes (Bardo, Donohew, & Harrington, 1996; Zimmerman, 2010; Bornovalova et al., 2009; Czervenka et al., 2013; Chase et al., 2017)

Novelty Seeking

Novelty seeking is a distinct and separate construct related to sensation seeking, in which individuals have a greater proclivity towards new, novel stimuli in comparison with familiar stimuli (Krebs, Scott, & Düzel, 2009; Noël et al., 2011; Wingo et al., 2016; Büchel et al., 2017). Novelty has been shown to affect behavior across individuals regardless of level of novelty seeking as a trait and has been shown to increase exploration of unknown information (Daw et al., 2006; Wittmann et al., 2008). Previous studies have found that novel stimuli are typically

preferred over familiar stimuli (all other factors being held equal) (Wittmann et al., 2008), and novelty alone can serve as a motivation for task performance even without associated explicit rewards (Koster et al., 2016). Further, participants show increased striatal activity in response to the presentation of novel stimuli, indicating activity in the mesolimbic reward system which may act as a “novelty bonus” for learning and decision making (Wittmann et al., 2008). It has been theorized in studies of human foraging and exploration behavior that novelty acts as an informational reward in the face of uncertainty (Kolling et al., 2012; Koster et al., 2016). Thus, reward deriving from novelty plays a role in reward-based decision making (Kolling et al., 2012; Koster et al., 2016). These novelty preference effects act similarly to, and often coexist with, sensation seeking and can lead to similar health risk behaviors, again when paired with low cognitive control (Bardo, Donohew, & Harrington, 1993; Büchel et al., 2017).

Approach-Avoidance

There are several behaviors that are particularly related to sensation seeking, novelty seeking and cognitive control, including approach-avoidance behaviors, explore-exploit choices, and engagement in goal-directed decision making (Bechara, 2005; Wittmann et al., 2008; Norbury et al., 2015; Erylimaz et al., 2017). Approach-avoidance characterizes the decision to engage with a stimulus or to avoid it, factoring in any potential reward or risks. This can be seen in nature through foraging, such as in a decision an animal must make to approach a food source when there is also the scent of a predator present. The interplay between receiving the reward (food) versus the risk of danger (the predator) requires effective reward-based decision making (Kolling et al., 2012). While not necessarily due to threat of a predator, similar decision-making challenges can be seen in humans when reward is present in a situation that also has risk. Specifically related to sensation seeking, it has been found that individuals who are high in

sensation seeking are more likely to weight the rewards of sensation present in a task and risk of negative outcomes from a task differently than those who are low in sensation seeking (Norbury et al., 2015). In one study, participants engaged in an economic task in which they either received a point-based reward or an electric shock and were given the odds of each (Norbury et al., 2015). Those high in sensation seeking both were more likely to take riskier odds in favor of shock and rated these middling odds trials with higher positive valence compared to low sensation seekers. Rather than more highly valuing the reward, it appears those high in sensation seeking are either valuing the risk itself intrinsically or are undervaluing the consequence. Novelty seeking affects approach-avoidance as well, giving preference to new and unknown stimuli, but without the need for risk or highly sensational stimuli as seen in sensation seeking (Daw et al., 2006; Krebs et al., 2009).

Explore-Exploit

Another reward-based decision affected by sensation seeking, novelty seeking, and cognitive control are explore-exploit choices. These are the decision to continue exploiting a reward or stimulus that has a known value or to explore – that is, try an alternative, unknown stimulus (Abram et al., 2016; Morris et al., 2016). Like approach-avoidance behaviors, the explore-exploit choice is also seen in foraging: the tradeoff between exploitation of a source of food repeatedly, even in the face of diminishing returns, versus the uncertainty in exploring to find another source which may be better (Kolling et al., 2012). In humans this can be tested using a simple task in which an individual can stay with a known reward or decide to pursue an alternative that may be better or worse and may have a cost associated such as time (Kakade & Dayan, 2002; Wittmann et al., 2008; Abram et al., 2016; Schulz & Gershman, 2019). Several studies have found that these explore-exploit decisions can be impacted by individual differences

including sensation seeking and novelty seeking (Dellu et al., 2008; Gottlieb & Oudeyer, 2018; Ciranka & van den Bos, 2021; Hogeveen et al., 2022). Explore-exploit decision making has also been used to study the effects of addictive behaviors with alcohol use disorder, finding that individuals with alcohol use disorder tend to exhibit more exploitative behavior and have altered neurological responses as measured through EEG (Morris et al., 2016; Campbell, 2021).

Goal-directed Behavior

Goal-directed behavior appears to be affected by sensation seeking and cognitive control. Goal-directed behavior and decision making revolves around making choices which are in the pursuit of a larger goal, either an intrinsic one chosen by the individual or one given as a task (Erylimaz et al., 2017; O'Doherty, Cockburn, & Pauli, 2017; Gottlieb & Oudeyer, 2018; Colaizzi et al., 2020). Success in maintaining these goal-directed decisions can be impacted by external distractions, rewards, and motivations (Erylimaz et al., 2017; Ruzs & Le Pelley, 2020). Low cognitive control and impulsivity are negatively associated with maintenance of goal-directed behavior (Bechara, 2005; Gratton et al., 2017) Sensation seeking on its own also appears to have an effect on pursuit of goals, though the exact mechanism is unclear, potentially being due to vulnerability to distraction or dissonance in motivation (Zuckerman, 1994; Roberti, 2004). An example specific to sensation seeking is the finding that individuals attempting to quit tobacco use who are higher in sensation seeking have more difficulty in tobacco cessation (Kahler et al., 2009).

Development of Reward Systems and Cognitive Control

In neural development, the difference in maturation rate for the reward system and cognitive control is critical for understanding adolescent behavior and decision-making processes (Steinberg et al., 2008; Kentopp et al., 2021). Because of the differential trajectory of these

systems, adolescents can be at a particularly vulnerable position, due to the earlier maturation of the reward system compared with cognitive control systems (Geier & Luna, 2009). This pattern has been seen in both animal models as well as neuroimaging studies of human brain development (Casey, Jones, & Hare 2008; Luna, Padmanabhan, & O’Hearn, 2010). While there are evolutionary benefits of this development cycle as well, such as an increase in exploratory behavior and increase in independent skill growth, it remains as also a period marked by risky decision making (Casey, Jones, & Hare, 2008). Adolescents engage in behaviors increasing likelihood of death, injury, or illness as reported in a 2005 National Youth Risk Behavior Survey, such as risky driving, substance use, and unprotected sex (Eaton et al., 2006). As a result, 70% of adolescent deaths in the U.S. arise from consequences of these actions, such as motor vehicle crashes, unintentional injuries and illness, and suicide (Eaton et al., 2006)

The mesocorticolimbic reward system, involving the dopaminergic midbrain and its connections to the prefrontal cortex, is responsible for processing rewarding stimuli and reinforcing behaviors (Depue & Collins, 1999; Düzel et al., 2009). This reward system undergoes significant developmental change during adolescence, marked by increased sensitivity to rewarding stimuli, also known as increased incentive motivation (Luciana & Collins, 2012). Early animal studies found increased dopamine levels in the striatum, specifically during rewarding events, which in turn led to greater reward sensitivity (Galván, 2010). In humans these effects are primarily studied using neuroimaging. The sensitivity of the reward system peaks during reward receipt in behavioral tasks during adolescence (Galván, 2010; Chein et al., 2011). This heightened sensitivity to reward can lead to an increased propensity for risk-taking behaviors, resulting in adolescents being more likely to seek out novel and rewarding experiences compared to children and adults (Steinberg, 2008). This increase in incentive

motivation appears to begin during childhood, peak during adolescence, then decline from adolescence to adulthood (Steinberg, 2010, Luciana & Collins, 2012). Relative to children, adolescents show increased responsivity in the reward system when anticipating rewards, viewing rewarding stimuli, and receiving rewards (Galván, 2010; Luciana & Collins, 2012). This pattern may be due to differences in the tonic and phasic firing of dopamine, in which adolescents have a higher tonic level (summative dopaminergic activity) which only allows strong phasic signals (high amplitude burst activity in response to salient events like reward learning) to facilitate reward-based learning (Luciana & Collins, 2012). Thus, during adolescence, highly incentivized motivational stimuli are both required and desired by the individual.

In contrast, the cognitive control system, supporting executive functions such as planning, decision-making, and impulse control, matures more gradually and continues to develop into young adulthood. A distributed neural circuitry underlies cognitive control, including the prefrontal cortex, anterior cingulate cortex, orbitofrontal cortex, basal ganglia, and others (Geier & Luna, 2009). Evidence for this maturational pattern comes from studies of gray matter morphology, neurochemical changes, and fMRI (Luna, Padmanabhan, & O’Hearn, 2010; Luciana & Collins, 2012). Response inhibition, a critical component of cognitive control that allows one to inhibit prepotent responses in favor of goal-directed decisions, continues to improve through adolescence into adulthood (Geier & Luna, 2009). It appears through fMRI studies of response inhibition that during response inhibition, the adolescent brain prioritizes less mature regions, like the dorsal lateral prefrontal cortex, over more developed inhibitory processing areas such as the cortical eye fields (Luna et al., 2001). Another component of cognitive control, working memory, also improves linearly throughout adolescence, with specific

aspects such as recall-guided action, manipulation, and self-organization of memory developing at different ages (Luciana et al., 2005). It should also be noted that tonic dopamine firing, heightened in adolescence, also alters the efficiency and flexibility of cognitive control processes in addition to its effects on the reward system (Goto et al., 2007). Higher tonic dopamine firing means that phasic dopaminergic firing also needs to increase, which in turn increases the burden on the cognitive control system, and thus self-regulation for adolescents becomes difficult (Luciana & Collins, 2012). So, it may not entirely be that adolescents suffer more in terms of weakness of the cognitive control system, but rather that demands on the cognitive control system are high due to the elevated maturation of the reward system (Luciana & Collins, 2012).

Thus, when looking at both systems, studies have shown that while the ventral striatum exhibits peak activity during adolescence, the prefrontal regions involved in cognitive control show a more linear increase in activation and connectivity throughout adolescence and into adulthood (Galván, 2010). The asynchronous maturation of these systems creates a period characterized by dissonance, a relatively mature reward system that drives sensation seeking behaviors and a still-developing cognitive control system that struggles to regulate these impulses (Geier & Luna, 2009). Particularly, the classic reward system areas in the limbic system tend to “win” over prefrontal control system areas, particularly during emotionally salient situations (Case, Jones, & Hare, 2008). This imbalance has been found to underpin many of the behavioral changes found in adolescence, such as substance use (Quinn & Harden, 2013). It should also be noted that while these increases in incentive motivation begin in childhood, health risk behaviors such as substance use and sexual experimentation do not typically begin until adolescence, as does self-reported sensation seeking (Eaton et al., 2006; Steinberg, 2010, Luciana & Collins, 2012).

The interaction between these two systems is influenced by environmental factors, such as peers, stress, or personality traits such as sensation seeking (Steinberg, 2010). For example, one study found that having peers nearby increases risk taking in adolescents taking, but not in adults or young adults, and was associated with social context specific increases in reward system response in the ventral striatum and orbitofrontal cortex (Chein et al., 2011). Adolescents in the same study showed reduced cognitive control activity compared to young adults and adults, but this activity was not mediated by social context (Chein et al., 2011). This indicates heightened reward sensitivity in risky decision making when peers are nearby in the adolescent brain in particular, an example of how the reward system reacts differently due to additional factors such as social context (Chein et al., 2011). Such stressors and external effects may be examples of the factors along with increased tonic dopamine firing that lead to a heavier burden on the cognitive control system during risky decision making, and thus leading to negative health outcomes.

Sensation Seeking and Negative Health Outcomes

Because of the motivation those high in sensation seeking have toward excessively stimulating situations in decision making and reduced valuation of risk, they have an increased risk for several negative health outcomes such as substance use disorder, self-harm, problem gambling, and risky sexual behavior (Conner, 2022). When high sensation seeking coexists with low cognitive control, there is a higher risk of engagement in these health risk behaviors (Zuckerman, 1994; Bardo, Donohew, & Harrington, 1996; Roberti, 2004; Fortune & Goodie, 2010; Noël et al., 2011; Knorr, Jenkins, & Conner, 2013; Quinn & Harden, 2013; Chase et al., 2017). Sensation seeking on its own without low cognitive control also predicts engagement in several risky, though not necessarily as harmful, behaviors, such as participation in extreme

sports or substance use experimentation (Weishaar et al., 2021; Conner, 2022). Therefore, to predict and potentially reduce these negative health effects, further understanding of sensation seeking and its related constructs is required and may ultimately lead to improved clinical outcomes.

Substance Use

Individuals who are high in sensation seeking personality trait who are also low in cognitive control have been found to engage in substance use more often (Zuckerman, 1994; Bardo, Donohew, & Harrington, 1996; Roberti, 2004; Quinn & Harden, 2013). Specifically, drug seeking behavior and exploration are correlated with high sensation and high novelty seeking and low cognitive control (Bardo, Donohew, & Harrington, 1996; Roberti, 2004). When paired with low cognitive control, particularly in adolescents where cognitive control is already reduced in comparison with adults, this leads to a greater development of substance misuse and addiction (de Wit, 2009; Quinn & Harden, 2013). Further, even when seeking treatment, higher levels of these traits lead to worse outcomes in compliance and successful maintenance of said treatment (Kahler et al., 2009).

Suicide and Non-suicidal Self Injury

Those high in sensation seeking have similarly been found to engage in greater rates of self-harm (Zuckerman, 1996; Roberti, 2004; Knorr, Jenkins, & Conner, 2013). Previous studies had found that there are higher incidences of non-suicidal self-injury when high in sensation seeking and low in cognitive control as well (Zuckerman, 1994; Roberti, 2004). However other studies using sensation seeking as measured by subscales of risk seeking and experience seeking found specifically that risk seeking on its own predicted greater rates of non-suicidal self-injury (Knorr, Jenkins, & Conner, 2013).

Individuals who are high in sensation seeking have been found to have an increased rate of suicidality and risk of death by suicide (Robert, 2004). This effect has been found in adolescents as well with one study finding a 3.43 times greater risk (measured by odds ratio) for suicidal ideation and 3.47 times greater risk of suicide attempts in adolescents who were high in sensation seeking personality trait. They were also found to be at a greater risk of depressive symptoms and sensation seeking, and even when using these traits as moderators, suicide attempts were still greater than twice as likely for adolescents high in sensation seeking (Ortin et al., 2012). This indicates that sensation seeking is further implicated in suicidal behaviors, even in absence of other common comorbidities.

Problem Gambling

Sensation seeking also appears to have a role in problem gambling behavior, leading to higher rates in high sensation seekers (Zuckerman, 1996; Fortune & Goodie, 2010; Brevers et al., 2012). Some research suggests that these findings were due to a difference in the SSS-V (one of the most common self-report measurements of sensation seeking personality trait discussed in detail below) subscale scores of disinhibition and boredom susceptibility, not sensation seeking in general (Zuckerman et al., 1978; Fortune & Goodie; 2010). Problem gamblers also appear to have lower cognitive control, reflected in greater difficulty in tasks such as delay discounting and, and pathological gamblers specifically can be differentiated using performance on the stop-signal task (Brevers et al., 2012, Steward et al., 2017). These differences in problem gamblers may manifest as a difficulty with explore/exploit decision making, which has similar neural correlates as with sensation seeking (Zuckerman, 1994; Daw et al., 2006; Hogeveen et al., 2022).

Risky Sexual Behavior

High sensation seeking combined with low cognitive control also contributes to a greater probability of engagement in risky sexual behavior (Zuckerman, 1996; Roberti, 2004). One study found greater impulsivity in a go/no go task using sexual stimuli in participants with higher sensation seeking (Macapagal et al., 2010). Cognitive control, but not reward seeking in general, also appears to be related to more risky sexual behavior in adolescents (Wasserman, Crockett, & Hoffman, 2017). The related construct of novelty seeking is also predictive of compulsive sexual behavior, with greater preference for novel sexual stimuli and greater rates of habituation to sexual stimuli in those scoring as high in novelty seeking (Banca et al., 2016). This trend toward risky sexual decision making also appears to have a sex-based component when not paired with low cognitive control, with some studies finding males at greater risk compared to females (Cyders et al., 2016).

Effects of Sensation Seeking not Moderated by Cognitive Control

While many of the negative health outcomes related to sensation seeking are typically associated with the combination of high sensation seeking with low cognitive control, some are inherent to sensation seeking alone. Those high in sensation seeking tend to participate in extreme sports at a greater rate (Weishaar et al., 2021). Further, those high in risk seeking are also more likely to be injured while participating in extreme sports if they score highly specifically in the sensation seeking measurement subscale of risk seeking (Weishaar et al., 2021). High sensation seeking is also indicative of experimentation with multiple substances, though not necessarily fitting under the category of substance misuse for each one (Quinn & Harden, 2013; Wingo et al., 2016; Conner 2022). These findings indicate that utilizing sensation

seeking personality trait as a predictor of engagement in negative health behaviors above and beyond low cognitive control would be valuable in treatment and counseling settings.

Measurement of Sensation Seeking

Psychometric properties of Measurement: Validity and Reliability

When considering psychometric measurement, certain properties of measurement and task design are critical for design, implementation, and interpretation of scientific studies. This includes the concepts of validity and reliability. Validity refers to the extent that a test, measurement, or study accurately measures or reflects what is intended to be measuring. Whereas reliability is concerned with the consistency of a metric across different times, administrators, and more (DeVellis & Thorpe, 2021).

Validity attempts to determine the credibility of results and conclusions drawn from such research. Thus, a measurement higher in validity would be considered more trustworthy relative to the construct it is measuring than one of low validity, and thus also hopefully more generalizable. Validity is crucial for both the integrity of the measure itself as well as in decision-making when extrapolating findings outside of research, such as in clinical settings (DeVellis & Thorpe, 2021). While there are many subtypes of validity concerned in psychometrics, for the measurement of sensation seeking and for comparing self-report to behavioral results four types of validity are particularly important: internal, construct, external, and ecological validity.

Internal validity concerns the extent to which the observed effects measured are due to the manipulation of the independent variable rather than confounding factors. This is particularly relevant in experimental research to establish causality, as a study high in internal validity implies that the observations of the study are attributable to the experimental treatment rather

than extraneous variables. External validity then is the extent to which results and measurements can be generalized to other settings and populations outside of the sample of the study. Thus, a highly externally valid study would be best for applying the results beyond the specific context of the study. There can be a tradeoff between internal and external validity, especially in psychological research, as highly controlled experimental conditions which create excellent internal validity may in turn reduce external validity if the conditions become too rigid (Creswell & Creswell, 2017).

Ecological validity is a specific aspect of external validity, particularly in behavioral studies, focusing on the applicability of a study to naturalistic environments where the behavior may occur. A study or metric high in ecological validity means that the conditions under which the data is measured closely resemble the real-life situations to which the findings are meant to apply. Some means to achieve greater ecological validity would be using natural settings as opposed to laboratory environments. It also includes naturalistic observation of behaviors and interactions, identifying self-directed behaviors and decision making as opposed to forced choices (Bronfenbrenner, 1977).

Construct validity is the degree to which the metric or study is accurately representing the theoretical construct it is intending to measure. Therefore, the closer a measurement can be to exact definition of the construct, the higher it would be in construct validity. This includes how well the measure correlates with other tests designed to measure the same construct, known as convergent validity. Though it is also important that a construct does not correlate too strongly with tests measuring different constructs, this being called discriminant validity (Messick, 1994).

One of the key purposes of using multiple metrics to measure a construct, such as both self-report and behavioral studies, is to establish validity (Messick, 1994). This validity extends

not just to the metrics and studies, but to the concepts they are measuring, as it further solidifies the specific traits unique to that phenomenon, increasing its construct validity in turn (Messick, 1994). While no measurement can be perfect, it is important to strive for a balance of internal and external validity in a task, while also considering if the task is remaining true to the construct itself, i.e., does it have high construct validity as well. A multiplicity of highly valid measurements for a construct is thus ideal (Creswell & Creswell, 2017).

Finally, another psychometric property of import to consider in task design is reliability and reproducibility. Reliability refers to the consistency of the measurements used in the metric over time and under different parameters. For example, this can include test-retest reliability, where a highly reliable metric would see the highly correlated scores at two different points in time. Or in scale development, a concern can be internal consistency reliability, or the degree to which items proposing to measure the same higher-level construct produce similar scores. Reliability is a prerequisite to internal validity, as a measure that is unreliable would be poor at accurately identifying a clear cause and effect relationship. This does not mean that a highly reliable construct is thus also highly valid however, as it is still important to remember that if the construct being measured is not accurately being captured by the metric, even if it were completely reliable it would not actually measure the desired phenomenon (DeVellis & Thorpe, 2021).

Further, it is also important to consider replicability and reproducibility in psychometrics when assessing a measurement and construct. Reproducibility refers to if a study can be replicated by another study using the same methodology that finds results consistent with the first study. Thus, a study which is replicable demonstrates that the findings found in one study are not limited to only that study, demonstrating reproducibility of the results. This in turn

supports the verification of such findings, and that the effects found are less likely to be driven by chance. It further facilitates building a cumulative body of scientific knowledge, allowing researchers to build upon the findings with greater confidence. Replication also aids in identifying and correction of errors and can help identify the most important findings if multiple claims were made in the first study. In making reproducibility a priority in psychometrics, a more robust and credible body of knowledge is possible (Goodman, Fanelli, & Ionnidis, 2016).

Self-Report Surveys of Sensation Seeking

Sensation seeking as a personality trait is primarily measured using self-report surveys. This originated with the first scale developed, the Sensation Seeking Scale (SSS), now typically measured using its fifth iteration the SSS-V (Zuckerman et al., 1972, Zuckerman et al., 1978). This scale attempted to validate its measurement through self-reported behavior, cognition, and motivation, as well as theoretical behavioral measures. The SSS-V has four subscales: thrill seeking, experience seeking, disinhibition, and boredom susceptibility. However, these subscales have since had difficulties with internal validity as well as reliability, particularly in younger samples (Roberti, 2004). Further, the language in the SSS-V has become more out of date over time and may no longer represent a useful metric for populations today, particularly adolescents (Arnett, 1994). Finally, it also is often conflated with impulsivity, specifically through its subscales of disinhibition and boredom susceptibility (Conner, 2022). This common correlation it has in impulsivity self-report and behavioral measures harms the metric in terms of construct validity as well, through poor discriminant validity.

In an effort to modernize the measurement of sensation seeking, other scales have been made to better discriminate the intricacies of sensation seeking, such as separating novelty and risk (Arnett, 1994). Sensation seeking has also been measured as a subscale itself in the context

of impulsivity and positive urgency through the UPPS-P Impulsive Behavior Scale (which includes subscales for negative urgency, lack of premeditation, lack of perseverance, sensation seeking, and positive urgency) (Cyders et al., 2007). Though again, here we see sensation seeking being conflated with impulsivity rather than having high construct validity on its own. It also has difficulties in criterion contamination, in that it asks about specific behaviors such as engaging in extreme sports, which would then create difficulties when trying to use this scale alongside inventories directly concerning extreme sports.

A scale has been developed and validated which separates sensation seeking into two subscales, risk seeking and experience seeking, the SSPTS (Sensation Seeking Personality Trait Scale; Conner, 2022). Risk seeking focuses on the proclivity to engage in risky behaviors whereas experience-seeking is a preference for novel and intense experiences that are not necessarily risky to health. This task sought for high construct validity in aiming to address the original intent of the construct of sensation seeking, high motivation for highly sensational stimuli, and a willingness to engage in risk to attain it. It further uses generalizable and not colloquial language in its questions, so as not to incur criterion contamination if paired with other metrics. It uses a 5-point Likert-type scale to prevent issues of dichotomous forced choice as well. By focusing on the original construct definition, the SSPTS serves to ultimately focus on the intrinsic motivation found within sensation seeking personality trait and stand as its own construct.

While self-report surveys are the standard method of measurement for sensation seeking personality trait, they are susceptible to multiple limitations, suggesting that behavioral measurements of sensation seeking may be useful. Self-report measurements often used in clinical settings have had limitations with reliability, particularly so with adolescents. In one

study on self-report substance use behaviors, 24% of participants who reported not using an indicated drug tested positive, and 34% who said they had taken the substance previously still tested negative (Williams & Nowatzki, 2005). As another example, research shows that adolescents have difficulty recalling information over large stretches of time, causing a greater number of factual reporting errors in self-report surveys administered to adolescents (Stanton et al., 1996). One study found that even height and weight, when self-reported, was also often biased and incorrect when compared with actual measurements (Elgar et al., 2005). The potential for biases by the participant, intentional or not, as well as response bias in a survey is a limitation of self-report surveys (Mortel et al., 2008). While self-report measures are by no means invalid, this is a situation in which multiple modalities may be needed to fully characterize sensation seeking, as well as improve the construct validity of each modality. This has led to the goal of being able to measure sensation seeking through additional means such as behavioral tasks.

Behavioral Measurement and Examples Related to Sensation Seeking

Importance of Behavioral Measurement

Multiple forms of measurement are necessary for validation and full understanding of human behavior (Daw et al., 2006; Moeller et al., 2013; Chase et al., 2017). In the context of sensation seeking, this means having a variety of methods to measure sensation seeking personality trait and its behavioral effects, beyond self-report surveys. The greater the variety of measures of a psychological construct we can aggregate, the better we are able to correctly formulate and test hypotheses using these measures, such as by using them as predictor variables in structural equation models, Bayesian predictors, or as classifiers in machine learning algorithms (Calhoun & Sui, 2016; Gillan et al., 2017). Further, behavioral, video, or non-reading-based tasks have been found to be useful in reducing the effects of group differences

based on race and reading comprehension, as well as test anxiety, allowing for more valid testing on a larger population if a reliably made task is created (Cahn & Schmitt, 1997; Mavridis & Tsiatsos, 2017)

Cognitive control and novelty seeking are commonly measured using behavioral tasks. These tasks use designs that have been staples of cognitive psychology for years, which allow for these constructs to be better attached to observable behavioral differences in an individual and removes some of the concerns from using self-report surveys alone. While some of these constructs also have self-report surveys available for measurement, such as the Barratt Impulsivity Scale (BIS) or Tridimensional Personality Questionnaire (TPQ), they are not the only source of measurement for these traits (Bardo, Donohew, & Harrington, 1996). It is worth examining these tasks to see how behavioral tasks could be developed to measure sensation seeking as well.

Behavioral Measures of Cognitive Control

Cognitive control is often measured using performance on several behavioral tasks, such as Go / No go, Stop Signal, Delayed Discounting, or simple timing tasks. Go / No go tasks measure a participants reaction time and ability to respond to a “go” signal and to inhibit response to a “no go” signal (Evenden, 1999; Spinella, 2004, Henges & Marcinski, 2012). Similarly, stop signal tasks involve a participant repeatedly making a response to a stimulus until a “stop signal” is present in some form, indicating that the participant must now stop responding. These tasks are measures of impulsivity (impulsivity being a component of cognitive control) in seeing an individual’s ability to inhibit behaviors. Delayed discounting tasks on the other hand present participants with some sort of variable resource, typically points or currency, with a possibility of getting more on certain trials with a delay if a certain action is done (Evenden,

1999; Mackillop et al., 2011; Tanaka et al., 2016; Steward et al., 2017). Individuals with lower cognitive control typically value the delayed reward lower than those with greater cognitive control. Lastly there are also simple timing estimation tasks, in which participants must only gauge how long from the start of the trial until the goal time, such as one minute. Individuals higher in impulsivity have greater difficulty accurately predicting the correct estimated goal time (Evenden, 1999, Wittmann & Paulus, 2008).

Behavioral Measures of Novelty Seeking

Novelty seeking can be predicted through several types of behavioral tasks as long as they feature novelty as one of the independent variables. Often, these designs are mixed with an explore/exploit decision making task (Wittmann, 2008; Djamshidian et al., 2011; Campbell, 2021, Hogeveen et al., 2022). One example is a four-armed bandit task in which participants were presented with four image stimuli, some of which were familiar and some novel, and which all had the same likelihood of giving a monetary reward. It was found that participants more often chose novel images with a higher frequency regardless of reward chance and exploited said “novel bandits” more often. This “novelty bonus” was further correlated with activity in the ventral striatum as well as with novelty seeking scores on the TPQ (Wittmann, 2008). Other studies have examined simply choosing novel stimuli more frequently based on the novelty alone in the absence of monetary or other rewards, such as with sexual stimuli (Banca et al., 2015). Novelty seeking has also been previously measured using attentional dot-probe paradigms to identify a bias for novel stimuli; dot-probe paradigms will be discussed in more detail below (Mechelmans et al., 2014).

Initial Attempts to Develop Sensation Seeking Behavioral Measures

While not intended for use to measure sensation seeking clinically, there has been some success in relating sensation seeking scores to behavioral measures. Norbury (2015) created a design in which the computational value given to various levels of possible reward or punishment could predict total sensation seeking score on the SSS-V. Participants chose a position on a scale on each trial with an associated possibility of either receiving a reward on one end or a mild electric shock on the other (Norbury et al., 2015). They found that individuals high in sensation seeking were more inclined to take a risk on more probable electric shock trials and rated these trials more positively than those low in sensation seeking (Norbury et al., 2015). While the association of this task design with SSS-V measures of sensation seeking is certainly a significant advancement in behavioral measures of sensation seeking, it was not intended for use of actual behavioral measurement and was more a method used by the researchers to further investigate the neurological effects of sensation seeking through concurrent EEG and PET measurements when in such an environment (Norbury et al., 2015). Further, a task dependent on mild electric shock does not translate well to clinical measurements or even other research questions. As well, the use of the SSS-V, which has the limitations and concerns about reliability as mentioned previously, leaves a task comparing performance to other sensation seeking scales still needed. Further advancements should still be attainable however, as many other studies have found measurable differences in the other related constructs mentioned previously such as novelty seeking, or in the context of substance misuse which is highly correlated to sensation seeking (Noël et. al, 2011; Morris et al., 2016; Chase et al., 2017).

Another task which has been previously associated with sensation seeking is the Balloon Analogue Risk Task (BART) (Lejuez et al., 2002). In the BART, a digital balloon is blown up by

the participant with each press of a button, until the balloon pops or the participant ends the trial and receives a reward which increases with the size of the balloon. The BART was for a time considered to be an appropriate measure of sensation seeking but over time results were found to be largely inconsistent with this construct. Recently there has been a greater emphasis on the differences between sensation seeking and impulsivity. The separation of these two constructs has led to the BART being characterized as having poor construct and external validity for sensation seeking, more closely measuring impulsivity, or even just gambling as opposed to sensation seeking itself, and likely does not reflect real-world risk-taking behaviors well (Hanoch, Johnson, & Wilke, 2006; Reynolds et al., 2006; Benjamin & Robbins, 2007; Bornovalova et al., 2009).

The Stoplight task, developed to measure engagement in risky decision making in driving has also been related to sensation seeking personality trait (Gardner & Steinberg, 2005, Steinberg, 2008; Steinberg et al., 2008; Chein et al., 2011). Originally based on an experiment designed to measure psychopathy called “Chicken” and now commonly referred to as the “Stoplight” task, this experiment involves the participant having to decide to proceed or stop when driving toward an intersection (Sheldrick, 2003; Gardner & Steinberg, 2005). Participants are given control of an animated car moving across a screen, on which eventually a yellow light will appear. At an unknown amount of time after the yellow light appears, it will turn red, a wall will appear, and the car will crash. Participants earn points for the further they drive in the task but lose all points on crashing. Studies using this task found increased sensation seeking relations to self-report sensation seeking as measured by the SSS-V but not impulsivity (Steinberg et al., 2008; Chein et al., 2011). This leaves Stoplight as more ecologically valid of a measure of sensation seeking personality trait than the BART, and more capable of not conflating with

impulsivity thus having greater construct validity as well. However, it has also been found to be related to impulsivity when specifically in an emotionally affective context (Botdorf et al., 2017). This implies that the Stoplight Task may not be completely independent of impulsivity, and moreover by attaching an explicit reward to the task, may still better reflect performance in gambling tasks than actual sensation seeking and the intrinsic motivation inherent to it.

In the first set of studies conducted I used an attentional dot probe design using sensation seeking based imagery (DiCecco, 2020). An attentional dot probe task is a behavioral task which attempts to measure automatic biases to specific types of stimuli, by presenting two images followed by a small dot replacing one of the images and measuring reaction time to the dot. An individual demonstrates an attentional bias by responding more quickly when the dot appears in the location congruent with their bias. An example is a study which found that former cigarette smokers responded more quickly when the location of the dot was congruent with smoking-based images (Ehrman et al., 2002). Others found similar results in other individuals seeking treatment for substance use, both as a measure of their attentional biases as well as a form of treatment itself to retrain the attentional bias (MacLean et al., 2018, MacLean, 2023).

Given the bias towards highly sensational stimuli shown by individuals high in sensation seeking, I hypothesized that a dot probe task might be effective in measuring these biases. I utilized a standard dot probe design using sensation seeking based images as the experimental stimuli, hypothesizing that those high in sensation seeking personality trait would have a quicker response time during congruent trials. This task was performed while brain activity was recorded using fNIRS, a neuroimaging technique capable of measuring the BOLD response at surface regions of the brain. However, I did not find any significant differences between high and low sensation seekers, either behaviorally or through fNIRS. Future attempts to modify the design

were unsuccessful and revealed no significant behavioral differences for high and low sensation seekers. After discussing the limitations of dot-probe designs and investigating possible reasons it may not have been effective, I ultimately concluded that due to the inherent nature of sensation seeking, the dot-probe paradigm may not have been stimulating enough for high sensation seekers to be effective in creating a bias. Therefore, I shifted my focus to developing more engaging tasks that might be more likely to elicit behavioral differences.

Stealth Assessment of Risk Seeking

Stealth assessments are measurements of behavior or learning that are meant to not be apparent to the participant and may not even be immediately seen as relevant to the task (or even as a task or learning environment) (Schute, 2011; Ke & Shute, 2015). Often, such tasks are focused on self-directed behaviors, or “emergent” behaviors. These are behaviors that are initiated by the participant and may or may not be directly related to the current objective. Examples of these are commonly found in video game research, usually looking at improvement in cognitions adjacent to the activities within the games. One such example is the game Portal 2, which requires a great deal of spatial reasoning to solve its puzzles (players / participants control two sides of a portal and can go through one end to end up on the other side). Participants have an overall goal, to proceed to the next room, but can solve the puzzles in several possible ways, allowing for emergent decision making which can be measured through stealth assessment. Researchers have found that in addition to performing better on classic spatial reasoning tasks after playing the game, in-game collected data (e.g., number of portals used per puzzle) was also significantly correlated with those classic spatial reasoning tasks. While initially framed to measure learning outcomes without disrupting the learning itself and maintain flow for the individual, it has also been proposed to be used to measure constructs such as individual

differences like risk taking based on elicited behaviors in a task (Schute, 2011; de-Juan-Ripoll et al., 2018).

Researchers were able to create such a task to implicitly measure risk taking in virtual reality environment. A maze-based game environment incorporating elements of risk and reward was developed to elicit naturalistic decisions on risk taking behavior. Variables taken from self-directed participant engagement in the task, specifically solving time for the maze, overall score, distance traveled, and use of a “shield” which reduced risk, were compared to endorsement of risky behaviors, cannabis consumption, and scores on the SSS-V and BIS. They found that distance traveled in the maze was correlated with sensation seeking personality trait, and impulsive individuals engaged in less use of the “shield”, implying greater desire to explore and less desire to finish the maze quickly, as well as less valuation of risk. Similarly, they found that participants with a higher score (denoting greater engagement in risk) also used the shield less and were higher in experience seeking according to the SSS-V, thus making experience seeking and shield use significant predictors for engaging in risky behaviors in the task (de-Juan-Ripoll et al., 2020). This task served as an example for potentially measuring sensation seeking in a virtual stealth assessment in a method that may be more ecologically valid due to the nature of sensation seeking personality trait. It may be possible to improve on such a task to measure the intrinsic motivation of sensation seeking through measurement of self-directed emergent behaviors in risky or exciting situations.

Virtual Reality Tasks

Given the de-Juan-Ripoll study previously mentioned and its approximation to the desired goals of our lab, it is worth examining some of the aspects of their study that may have led to their successes, such as use of a Virtual Reality environment (de-Juan-Ripoll et al., 2020).

In recent years, the use of Virtual Reality (VR) based tasks has seen an increase in the realm of psychology and neuroscience, attempting to create more ecologically valid studies in various modalities such as executive functioning tasks, moral dilemmas, and social neuroscience (Parsons, 2015, Kisker et al., 2021). VR is thought to result in an increase in “immersion” and thus a more “naturalistic” environment than a lab-based paradigm, allowing for simulations of natural events and social situations (Bohil, Alicia, & Biocca, 2011; Kisker et al., 2021).

The use of VR in psychology and neuroscience started gaining traction when used in spatial navigation and memory research, allowing for virtual Morris Water Maze and Radial Maze tasks, aiding in translation between use of these tasks in rodent models to human cognition (Bohil, Alicia, & Biocca, 2011). From there, applications started in additional modalities, such as memory where VR scenes are capable of eliciting states of déjà vu (McNeely-White & Cleary, 2023). VR has further been applied in Social Neuroscience, allowing for simulated social situations, as well as in therapeutic contexts such as for social anxiety or phobia exposure treatments (Bohil, Alicia, & Biocca, 2011; Teo et al., 2016). Virtual reality also allows for simulations of risky experiences which cannot be done in the real-world, such as criminal acts like burglary (van Gelder et al., 2017). Similarly, it has seen use in avoidance behavior studies as well, with increased negative valence of negative stimuli (Binder & Spoormaker, 2020). Finally, VR has seen some success in being useful in CBT treatments for gambling addiction as better for eliciting a sense of immersion when attempting to address automatic thoughts and gambling specific thoughts (Bouchard et al., 2017; Chrétien et al., 2018).

In some of these instances VR tasks have been shown to improve reliability and increase validity in tasks when compared to pen and paper or computer-based tasks (Kisker et al., 2021). Much of this work has focused on neuropsychological testing and improvements for patient

outcomes and ecological validity through testing (Bell et al., 2020; Pieri, Tosi, & Romano, 2023). VR has been shown to result in more reliable results for cognitive training for individuals with mild cognitive impairment in several domains, specifically those that are less generalized and closer to real world situations (Hung et al., 2020). In this study the benefits were considered to have been the higher ecological validity, greater immersion and arousal, and increased motivation (Hung et al., 2020). Another study looking at the advantage of VR over computer-based measures of spatial reasoning found that the VR tasks were able to reduce variance when compared to the computer-based tasks (Weiner & Sanchez, 2020). In a fear response with simultaneous EEG in neutral VR, fear VR, and a real-life experience the fear, classically found laboratory measures of fear response through EEG were not found in any condition, even the real-life experience (Kisker et al., 2021). However, the behavioral and affective responses were comparable in the fear VR and real-life condition, suggesting that the VR environment may have greater ecological validity compared to laboratory-based measures (Kisker et al., 2021). Finally, in a meta-analysis looking at risk-taking behaviors in individuals with ADHD, it was found that virtual reality assessments produced the largest effect sizes when compared to computer-based assessments and self-report measures (Roberts et al., 2021). The aggregated effect sizes of virtual reality assessments were greater by 30-40% than the other types of assessment, implying that virtual reality assessments may be more sensitive to the modest effects of risk taking in individuals with ADHD (Roberts et al., 2021). Given the use for individual differences in psychiatric treatment, and other studies of its effect on risky decision making, it is possible that a VR environment may increase the efficacy of a sensation seeking measure (de-Juan-Ripoll et al., 2018; de-Juan-Ripoll et al., 2020; Fu, Liu, & Zhang, 2021). That is, given the inherent bias shown by high sensation seekers to prefer highly engaging stimuli, combined with the increased

immersion of a VR environment, a VR task may have significant benefits over a computer-based task of in eliciting sensation seeking behaviors and therefore measuring sensation seeking personality trait.

Current Study

Because of the concerns of the validity of self-report measures (particularly the SSS-V) in their relation to real-world risk-taking behavior, I sought to create a behavioral task capable of measuring sensation seeking focusing on the intrinsic motivation inherent in the original definition of the trait: higher preference for highly stimulating experiences and disregard for risk to do so. I developed two tasks using the stealth assessment framework under the principle of emergent behavior to measure natural decision making for risk seeking and experience seeking (van Gelder et al., 2017; De-Juan-Ripoll et al., 2018; de-Juan-Ripoll et al., 2020). The term emergent behavior has been adapted from artificial intelligence and machine learning literature to refer to behavior that occurs outside of the guidelines dictated to the machine, here referring to behavior I have not specified to the participant but is capable of being measured. Three experiments discussed in the following chapters were investigated using these emergent tasks to measure sensation seeking personality trait. The first experiment aimed to test whether these tasks showed psychometric validity by examining relationships between the emergent task measures and self-report personality traits such as sensation seeking (measured by the SSPTS and SUPPS-P) and impulsivity (measured by the BIS-15). The second study was a replication of the first study that examined relationships between behaviors measured in the emergent tasks and reported substance use and risky sexual behavior. Finally, the third study tested whether incorporating VR to increase immersion in the task would promote further engagement and ecological validity to increase the psychometric validity of the task.

STUDY 1 – INITIAL VALIDATION

Description

The primary goal of the initial study was to test the validity of two tasks in measuring sensation seeking personality trait similarly to the SSPTS (Conner, 2022). I sought to achieve tasks with high construct validity by modeling the emergent behaviors in the task off the concepts of risk and experience seeking from SSPTS and the original sensation seeking definition. This was done through comparing behavioral measures extracted from the task to the individual subscale scores for risk seeking and experience seeking as measured on the SSPTS. I also sought to have reasonably higher external and ecological validity to create situations in which those high in sensation seeking would be motivated towards self-directed sensation seeking behavior. Thus, if this task was capable of being correlated to the SSPTS, the task in turn may be considered to have construct and internal validity, converging in validity with the SSPTS.

Both tasks were three-dimensional virtual computer tasks created using the Unity game engine (version 2021 LTS) and scripted with Microsoft Visual Studio 2017 in C# (Unity Technologies, 2005; Microsoft Corporation, 2017). The 3D environments for the tasks and first-person perspective were crucial in attempting to create higher ecological validity compared to laboratory cognitive measures. These tasks were completely novel and used stealth assessment of emergent behavior rather than specifying to the participant what behaviors could or should be engaged in. One task was aimed at measuring risk seeking and one aimed at experience seeking.

For the risk seeking task, I sought to create a situation in which participants could engage in “risky” behavior in a virtual environment without relevance to the task at hand, so the

engagement in the risky behavior was completely of their own volition. I decided to create a task in which the participant was asked to pursue a goal on top of a building in a cityscape in which they could jump from or fall from accidentally if not careful. This allowed me to measure whether participants chose to engage in risky behaviors such as standing near the edge or jumping off rather than the designated goal. This task was named the City Task.

To measure experience seeking, I wanted a situation in which participants were given a goal, but also were presented with a variety of interesting stimuli present as distractors so that they would have a choice between focusing on achieving the goal and exploring new items. This led to creation of a task in which the participants walk along a path in a forest with the goal of reaching the end but experience several distractors in the forest along the way which they could choose to explore instead. This task was named the Path Task.

City Task

A virtual city environment was created surrounded by a mountainous region, with the participants being placed near the top of a skyscraper in the city. The roof they were placed on had one walled side that was completely safe, a fenced side with a viewing platform on it, a completely unguarded side, and one side featuring a small “board” which the participant could stand on. The controls for the participant were deliberately made slightly slippery which could cause a fall to the streets below if the participant did not exercise caution near the unguarded edges. If the participant ever fell or jumped off the building and landed on the street below, they heard a loud “thud” sound and were placed back at the top of the skyscraper. Several other buildings surrounded the main skyscraper, and some could also be jumped to if the participant attempted and was able to time the action correctly.

Participants were told that the study was interested in perspectives and instructed them to take the best picture they could in five minutes. Pressing a button elicited a photo snapping visual and increased a counter measuring the number of pictures they had taken. Participants were able to move in the three-dimensional space, as well as run and jump around the environment. Several invisible detector zones were placed around various locations of the skyscraper to quantify their actions. The variables measured during the task were:

1. Total time on the edge of the skyscraper (EdgeZone)
2. Total time on the viewing platform (PlatformZone)
3. Total time on the board going off of the skyscraper (BoardZone)
4. Number of times they jumped over the fence by the viewing platform (FenceJump)
5. Number of times they jumped off the board (BoardJump)
6. Number of pictures taken (PicsTaken)
7. Time it took for them to initially approach the edge of the skyscraper (TimeToEdge)
8. Time it took for them to step onto the board (TimeToBoard)
9. Time it took for them to fall the first time off the skyscraper (TimeToFall)

After the five minutes were up the experiment ended automatically. Participants were then asked a few questions based on their experience, such as how focused they were on the task, and asked to rate their levels of anxiety, excitement, subjective arousal, and how seriously they took the experiment, in a Likert-type scale or sliding scale for rating their subjective experience. The full questionnaire as well as coding for answers for Study 1 is included in Appendix A.

Path Task

The Path Task was implemented in a forest environment with a path through the middle and various types of trees and foliage off the path in the forest on either side. Participants were

told that they were on a path which leads to their grandmother's house. They were instructed to follow the path to the end to reach their grandmother's house within five minutes. When they reached the house at the end, they were given a message that they made it in time, but the task would continue for the remainder of the five minutes. There was also a timer in the corner to let the participant know how much time was left before the five minutes expired.

Along the way there were several distractors placed along the path that were meant to act as interesting and novel stimuli which the participants could choose to investigate if they saw fit. There were further distractions visible from those points of interest deeper in the forest as well so that there should always be at least one possible distractor visible. The stimuli consisted of animated models, particle effects, sound cues, and events. Examples include a deer running deeper into the forest near the beginning of the path, the sound of a bear roaring in the distance, a fire deeper into the forest, areas in which music could be heard, and blocks which could be moved around by the participant by walking into them. There were over 50 possible distractions and points of interest in total. The measured variables in the Path Task were:

1. The total amount of time spent in the forest sections, off the path (Score)
2. Whether they reached the house at the end at all (EndReached)
3. The time it took to reach the house the first time (EndZoneTime)

After five minutes the experiment ended automatically. Participants were then asked a few questions pertaining to their experience in the task, such as how focused they were on the task, how much their behavior would match their real-life decision making, anxiety, arousal, and how seriously they took the task. These questions will also be included in full in Appendix A.

Hypotheses

I made the following hypotheses relating to the behaviors measured by the City and Path Tasks:

H1: The City Task measured behaviors will be related to risk seeking as measured by the SSPTS and sensation seeking as measured by the SUPPS-P.

H2: The Path Task measured behaviors will be related to experience seeking as measured by the SSPTS and sensation seeking as measured by the SUPPS-P.

H3: Neither the City nor Path Task will have significant relations with impulsivity as measured by the BIS-15.

H4: The relations found between the measured behaviors and self-reported personality measurements will not be significantly mediated by sex assigned at birth, age, video game experience, fear of heights, or experience hiking, as reported by the participants.

Method

Participants

Participants (n=587, female = 389 (66.3%)) were recruited from students in the PSY100 and PSY 250 research pool. Students in these courses participated in various research studies for class credit as compensation. Due to the demographics of the course itself and it being an undergraduate course at a university in Northern Colorado, the sample primarily consisted of white young adults between the ages of 18-22. Inclusion criteria only consisted of requiring participants to be over the age of 18, with no additional exclusionary criteria.

Materials

Measurements included a combination of the City Task, Path Task, and Qualtrics surveys. Participants completed a battery of questionnaires in Qualtrics first, some of which

pertained to this experiment while others were being used by other researchers in our lab for other projects. The relevant measurements for the analysis of the City and Path Tasks were:

1. Demographics
2. The SSPTS (Sensation Seeking Personality Trait Scale) (Conner, 2022)
 - a. Subscales of risk seeking and experience seeking
3. The BIS– 15 (Barratt Impulsiveness Scale – short version of version 11, 15 item variant) (Spinella, 2007)
4. SUPPS-P (UPPS-P scale short version) (Billieux et al., 2012)
5. Short custom questionnaire for the tasks concerning prior experience with video games, heights, hiking, etc.

Procedure

The study was conducted in a small laboratory space with multiple computers to allow for a possible six participants at a time. Each participant had access to their own desktop computer in a small cubicle-like space with privacy screens on either side. There was one administrator monitoring the experiment and answering any questions on the material. This administrator sat at a desk in the corner of the room and did not directly observe the participant's answers and actions at all times. Following standard consenting procedures, participants began by filling out standard demographics-based questions on their gender, age, ethnicity, and any mental health diagnoses as is typical for our lab. They then completed the SSPTS and the BIS-15, followed by a few additional surveys not relevant to the current work (these were included in the battery for separate, unrelated studies), and followed in turn by the SUPPS-P and the short custom questionnaire. In total, the questionnaires took approximately 30 minutes to complete. Participants then received instructions and controls for the City Task and spent 5 minutes

completing it followed by the subsequent questions pertaining to City Task. After the City Task questions, the participants completed the Path Task and the questions specific to it as well.

Data Analysis Plan

All data analyses for Study 1 were completed using R (R version 4.1.1, 2021). Initial testing would consist of Pearson correlations ran between all measured subscales of the SSPTS, BIS-15, SUPPS-P and all behavioral measurements from the City and Path Tasks using an alpha level of 0.05 to as the threshold for significance. Initial correlations were then corrected for multiple comparisons using the Holm-Bonferroni method. The Holm-Bonferroni method was chosen as the multiple comparison correction because it is an iterative version of the Bonferroni method, which allows for a more powerful correction method which is conservative in preventing false positive results (Type 1 errors) but also less likely to cause false negatives (Type 2 errors) than the original Bonferroni method. Following the Pearson correlations, simple linear regressions will be run between each individual pair of emergent behavior measurement to each subscale of the self-report scales to better assess variance and trends in the models. These regressions were also corrected for multiple comparisons using a Holm-Bonferroni method. Additional multiple linear regressions were then conducted on the significant pairs of behavioral measurement and self-report measures to assess if any of the additional information included in the questionnaire had a significant interaction with the main pairing of interest. These variables included sex assigned at birth, age, video game experience, fear of heights, and hiking experience.

Results

Pearson correlations were first run to assess the association of the task with sensation seeking self-report surveys to establish construct and internal validity. In the initial Pearson

correlations, many significant relationships were found between behavior in each task and the self-report measurements, primarily between the SSPTS measurements and SUPPS-P Sensation Seeking score, implying a greater emphasis of measuring sensation seeking behavior than impulsivity. Currently presented data are a correlation table of the relations between the emergent behaviors measured and sensation seeking self-report measures, and some select linear regressions comparing the relations between some of the stronger relationships. Table 1 presents the correlations between the SSPTS risk seeking (SSPTRS) and experience seeking (SSPTES) scales along with the sensation seeking subscale of the SUPPS-P (SUPPS_SS) with the behavioral measurements. Correlations which survived multiple comparison correction of the correlation and in the simple linear regressions are highlighted in bold. All p values reported reflect the uncorrected by multiple comparison correction values. After correcting for multiple comparisons, all p-values were required to satisfy a 0.05 corrected alpha threshold for statistical significance. Note that no relationships to the BIS-15 measures are included in the table as none survived multiple comparison correction.

For the risk seeking scale of the SSPTS there was a trend for higher risk seeking scores to correlate with less time spent on the edge ($r = -.12, p < .01$) and board ($r = -.20, p < .01$), but more time spent out of bounds or falling ($r = .15, p < .01$) and faster time in getting to the board ($r = -.19, p < .01$), and falling ($r = -.20, p < .01$). Those high in risk seeking were also more likely to jump off the board ($r = .19, p < .01$) or over the fence ($r = .14, p < .01$). They also spent greater time in the forest ($r = .23, p < .01$) and took longer to reach the goal in the path task ($r = .16, p < .01$), which was not seen in the high experience seekers. However, those high in experience seeking did take less time to approach the edge ($r = -.14, p < .01$) and fall ($r = -.13, p < .01$) in the City Task, similarly to risk seekers.

When looking at the SUPPS-P measure of sensation seeking, similar relations were found as those with the SSPTS risk seeking measurement. Those high in SUPPS-P sensation seeking similarly spent less time on the board ($r = 0.21, p < .01$) and more time out of bounds ($r = .17, p < .01$). They also further jumped off the board ($r = .18, p < .01$) and over the fence ($r = .11, p < .01$). High SUPPS-P Sensation Seekers similarly reached the riskier areas of the building, the edge ($r = -.16, p < .01$), board ($r = -.23, p < .01$), and falling ($r = -.23, p < .01$). In the Path Task they again similarly to risk seeking had increased time in the forest ($r = .22, p < .01$) and took longer to reach the end ($r = .17, p < .01$).

Table 1

Means, standard deviations, and correlations with confidence intervals of Study 1 behavioral measurements and the SSPTS and SUPPS-P sensation seeking scores.

Variable	<i>M</i>	<i>SD</i>	Risk Seeking	Experience Seeking	SUPPS-P Sensation Seeking
Risk Seeking	13.61	3.76			
Experience Seeking	19.90	2.74	.31** [.23, .38]		
SUPPS-P Sensation Seeking	11.49	2.53	.61** [.56, .66]	.50** [.43, .55]	
edgeZone	54.52	29.62	-.12** [-.20, -.04]	-.00 [-.08, .08]	-.11** [-.19, -.03]
platformZone	23.56	21.96	.01 [-.07, .09]	.03 [-.05, .11]	.04 [-.04, .12]
boardZone	29.51	18.19	-.20** [-.28, -.12]	-.09* [-.16, -.00]	-.21** [-.29, -.13]
outZone	33.39	45.29	.15** [.07, .23]	.06 [-.03, .14]	.17** [.09, .25]
fenceJump	0.64	1.06	.14** [.06, .22]	.03 [-.05, .11]	.11** [.03, .19]
boardJump	1.11	1.28	.19** [.11, .27]	.07 [-.01, .15]	.18** [.10, .26]
picsTaken	17.12	12.32	.04 [-.04, .12]	-.04 [-.12, .04]	-.00 [-.08, .08]
timeToEdge	9.96	15.22	-.07 [-.15, .01]	-.14** [-.22, -.06]	-.16** [-.24, -.08]
timeToBoard	28.26	30.51	-.19** [-.26, -.11]	-.12** [-.20, -.04]	-.23** [-.31, -.15]
timeToFall	29.73	29.65	-.20** [-.28, -.13]	-.13** [-.21, -.05]	-.23** [-.30, -.15]
score	73.99	65.15	.23** [.15, .30]	.06 [-.02, .14]	.22** [.15, .30]
endZoneTime	24.06	13.11	.16** [.08, .23]	.04 [-.04, .13]	.17** [.09, .25]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate

the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$, uncorrected for multiple comparison. Bolded values reflect $p < .05$ following the Holm-Bonferroni method of multiple comparison correction.

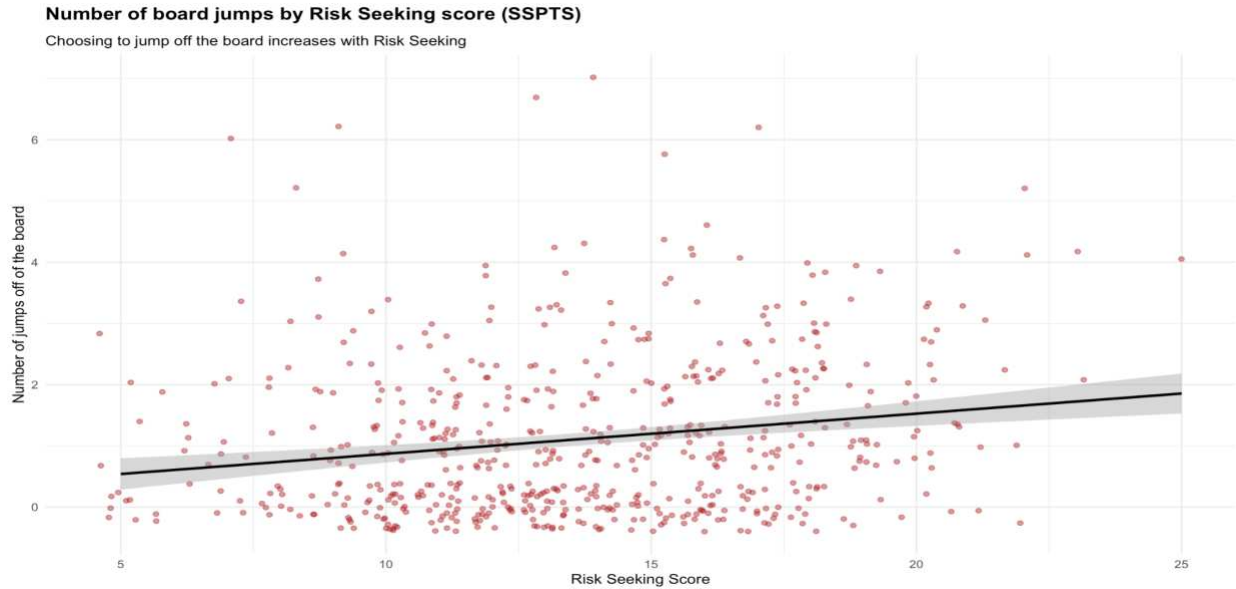


Figure 1: Linear regression plot of the relation between risk seeking score and number of jumps off the board in the City Task ($p < .0001$, $R^2 = .0345$)



Figure 2: Linear regression plot of the relation between risk seeking score and time spent in the forest in the Path Task ($p < .0001$, $R^2 = .0498$)

Additional regressions were run to investigate the relation between demographic variables, namely sex assigned at birth and age. Several small sex differences were identified for each variable in the City and Path Tasks. Females spent a greater amount of time standing on the edge of the building ($\beta = -10.44, p < .001$) and the board ($\beta = -7.72, p < .001$). They were also quicker to approach the edge ($\beta = -5.18, p < .001$), board, ($\beta = -16.86, p < .001$), and to fall ($\beta = -12.03, p < .001$). Meanwhile, males spent a greater amount of time on the viewing platform ($\beta = 5.61, p < .01$) and out of bounds ($\beta = 16.83, p < .001$). They were more likely to jump over the fence ($\beta = .57, p < .001$) and off the board ($\beta = .93, p < .001$) as well as took more pictures overall ($\beta = 3.74, p < .001$). Finally in the Path task, males spent a greater amount of time in the forest ($\beta = 47.522, p < .001$) and took longer to reach the goal ($\beta = 6.41, p < .001$). With age being run as the regressor, there was a trend where older participants spent less time on the board ($\beta = -.66, p < .05$) and took longer to fall for the first time ($\beta = 1.78, p < .001$).

I then ran multiple regression linear models of mediation on the surviving linear regressions, adding the variables of reported video game experience, fear of heights, and hiking. Only reported videogame experience acted as an additional predictor for the Score variable in the Path Task with SSPTS as the main predictor, ($\beta = 31.43, p < .01$), but it did not eliminate the main effect of risk seeking ($\beta = 3.9, p < .001$). When using sex assigned at birth as a mediator, there was a loss of the main effect of the fenceJump and endZoneTime variables after correcting for multiple comparisons, though the other variables remained significant.

Discussion

Hypothesis 1 was supported through the relations of several measured variables in the City Task to risk seeking. Hypothesis 2 was unfortunately not fully supported in that experience seeking was not related to the Path Task, however relations were found for the Path Task and

SUPPS-P sensation seeking. Hypothesis 3 was supported through the lack of relations between either task with impulsivity, implying discriminant validity for sensation seeking. And finally, Hypothesis 4 was predominantly supported, with only a few relations to self-report sensation seeking being removed or accounted for by interactions with video game experience or sex assigned at birth.

These findings show initial promise for the City and Path tasks to measure risk seeking and experience seeking with decent convergent internal validity and thus construct validity according to the SSPTS. This is especially promising given the inherent high ecological validity from the emergent, self-directed behavioral design of the task. This would make it the first example of a behavioral task capable of measuring the intrinsic motivation of sensation seeking, and the first behavioral task measured alongside the SSPTS. Notably, it appears that those high in risk seeking are spending less time at the “dangerous” areas of the building in the city task, but instead are spending more time out of bounds or falling, indicating that there may be a greater tendency for risk taking to correspond with experiencing falling rather than just looking over the edge or being close to danger. This is consistent with the trend that those high in risk seeking were more likely to jump over the fence or off the board during the task and approached the board and fell more quickly than other participants. This was also seen in the SUPPS-P where those high in sensation seeking, which was very similar to those high in risk seeking in terms of correlations, with the only difference being that they were also more likely to approach the edge more quickly. Risk Seeking, Experience Seeking, and SUPPS-P Sensation Seeking were also correlated with each other as expected from prior literature (Conner, 2022). Although this task was not intended to measure experience seeking, it also appeared that experience seekers were

more likely to approach the dangerous areas and fall more quickly, but not jump off. This may indicate a potential to selectively assess risk and experience seeking with one task.

The results of the Path task were inconsistent with our hypotheses that this task would correlate with experience seeking. Risk seeking and SUPPS-P sensation seeking significantly correlated with spending time in the forest and taking longer to reach the goal, but experience seeking did not. It is possible that the risk that taking time in the forest would result in not reaching their goal in time was salient for the participants, and that experience seekers were not as willing to take that risk. All results were found not to be significantly mediated by experience playing video games or hiking as measured in the supplemental task questions.

These results should be interpreted cautiously given the small sizes of the correlations and high amount of variance seen in the linear regressions. Further, there are clear sex effects and minor age effects found in the tasks as well which may be influencing the results of the sensation seeking correlations. However, these tasks were sufficiently promising for us to continue developing them. I next wanted to validate these results to ensure they would replicate, to assess reliability as well as internal validity of the tasks, as well as to gauge whether the behavioral measures would show a relation to actual sensation seeking related negative health behaviors. This could further improve the external validity of the task in comparing to real-world outcomes related to sensation seeking personality trait, as well as show promise for potential clinical applications in the future. The age based main effects for time spent on the board was lost when also using risk seeking as a predictor.

STUDY 2 – REPLICATION AND COMPARISON TO HEALTH RISK BEHAVIORS

Description

The purposes of study 2 were two-fold. Two separate groups (Group 1 and Group 2) underwent slightly different procedures to achieve those purposes. The first goal was to simply replicate the findings of Study 1. The procedure for participants in this group was the same as study 1 with the following changes:

1. The BIS-15 was not included in this study, due to the lack of relation to the emergent tasks as seen in Study 1.
2. Several other measures (not related to the emergent tasks) were added to our shared lab battery concerning multiple risky behaviors and clinical outcomes. These measures replaced other unrelated surveys from the battery used for Study 1 and thus no overall changes to the time for the task were made.

For Group 2, I made the same changes as for Group 1. In addition, I also included two behavioral inventories containing questions about multiple risky behaviors. These were the RBI (Risky Behavior Inventory) sections specifically focusing on Sexual Behavior and Substance Use.

Hypotheses

I hypothesized that self-reported behaviors would also be related to the emergent behavior in the tasks. Therefore, the hypotheses for Study 2 were:

H1: The results for study 2 will be consistent with the existing findings from study 1, demonstrating reproducibility in the tasks and their relation to sensation seeking.

H2: Behaviors measured by the emergent behavioral tasks will have significant relations with self-reported engagement and participation in health risk behaviors pertaining to substance use and risky sexual behavior.

Method

Participants

Participants (Group 1: n = 164, Group 2: n = 136, Total n = 300), were recruited from students in the PSY100 and PSY 250 research pool. Students in these courses participated in various research studies for class credit as compensation. As with Study 1 the demographics of the participant pool reflected those of the students enrolled in these undergraduate courses at a university in Northern Colorado. The sample primarily consisted of white young adults between the ages of 18-22. Inclusion criteria again only consisted of requiring participants to be over the age of 18, with no additional exclusionary criteria.

Materials

The materials were identical to those in Study 1 apart from the removal of the BIS-15 and the addition of the two Risky Behavior Inventories in Group 2, one focusing on Sexual Behavior, and one on Substance Use. The Sexual Behavior RBI consisted of questions such as the participant's number of partners, number of times they engaged in underprotected and unprotected sexual behavior, and similar questions. If endorsement of a particular type of behavior was indicated, the participant was asked a series of follow-up questions such as frequency and motivation. For the Substance Use RBI, questions included endorsement of ever using several different substances, such as cocaine, hallucinogens, ketamine, etc. as well as substance use behaviors, such as substance use before going to work or school, use while pregnant, use while driving, etc. As with the Sexual Behavior RBI, these questions were

followed by questions on frequency and motivation for the behavior if it was endorsed it initially. Both RBIs on Substance Use and Risky Sexual Behavior are included with the other questions in the survey as found in Appendix B.

Procedure

In Group 1, participants underwent identical procedures to Study 1, except for some additional surveys between the SUPPS-P and the City Task and ending directly after the Path Task questions. In Group 2, the BIS-15 was removed, and the RBI measures were added between the SUPPS-P and City Task. Otherwise, it also proceeded identically to Group 1's procedure.

Data Analysis Plan

All analyses were again accomplished using R (R Version 4.1.1, 2021). Analyses were initially done in the same manner as with Study 1: correlations and linear regressions were performed in R to compare the relationships between the behavioral measurements from the City and Path Tasks and the SSPTS subscales and SUPPS-P. A Holm-Bonferroni method of correction for multiple comparisons was then used. These results could then be directly compared to those in Study 1 to assess reliability of the task and its results across the two studies. Mediations would again be assessed on surviving pairs of variables again as well to ensure no significant interactions exist. In addition to the replication of the analyses from Study 1, additional correlations and linear regressions will be run on the measures of the Substance Use and Risky Sexual Behavior RBI's, also with Holm-Bonferroni multiple comparison corrections and checks for interaction with the additional questionnaire variables.

Results

Pearson correlations were run on the same variables as in Study 1 to assess similarity and to see if the effects replicated. Similar results were found, though with some differences to Study

1. In general, significance levels were not always as high as in Study 1, and some previously found relations did not survive multiple comparison correction in Study 2, potentially due to the smaller sample size. These results are found in Table 2, with relations that survived multiple comparison correction for both the correlations and individual linear regressions highlighted in bold.

As seen in Table 2, focusing first on the city task, **edgeZone** ($r = -.16, p < .01$), **boardZone** ($r = -.16, p < .01$), and **outZone** ($r = .14, p < .05$) were all significantly correlated again with the SSPTRS as was found in Study 1, in the same direction, and close in magnitude, though no longer survive multiple comparison correction. **FenceJump** ($r = .12, p < .05$) and **boardJump** ($r = -.21, p < .01$) correlations were still significant with risk seeking as well, though **fenceJump** had smaller r value and not surviving multiple comparison correction, with those high in risk seeking jumping more often. **BoardJump** however did still survive multiple comparison correction for both risk seeking and SUPPS-P Sensation Seeking ($r = .23, p < .01$), implying the emergent behavior in the task still resulting in those high in risk seeking jumping more often in this manner. The time to the edge ($r = -.13, p < .05$), **board** ($r = -.26, p < .05$), and **fall** ($r = -.32, p < .01$) were also still significantly correlated with risk seeking and similar to Study 1's results with only **timeToEdge** being lost to multiple comparison correction.

When looking at correlations with the SUPPS-P sensation seeking measure, results were again highly similar to Study 1, though the correlation with **fenceJump** and **edgeZone** no longer passed the threshold for significance. The relation between SUPPS-P sensation seeking and **outZone** ($r = .20, p < .01$), **boardJump** ($r = .23, p < .01$), the **timeToEdge** ($r = -.21, p < .01$), **board** ($r = -.31, p < .01$), and **fall** ($r = -.33, p < .01$) variables are still maintained and survive multiple

comparison correction. The SSPTS measure of experience seeking did not correlate with any of the City task measures, in contrast with the significant relations seen in Study 1.

Correlations with the Path Task measures in Study 2 (see Table 2, Score and endZoneTime) were largely similar to Study 1. When examining correlation with the SSPTS measure of risk seeking, score was significant as in Study 1 ($r = .22, p < .01$), with high sensation seekers spending longer in the forest, but the correlations with endZoneTime did not make the threshold for significance in Study 2. Similarly, correlations with the SUPPS-P were significant in both Study 1 and 2 for both score ($r = .26, p < .01$) and endZoneTime ($r = .13, p < .05$), with high sensation seekers staying in the forest for longer times than low sensation seekers, though endZoneTime did not survive multiple comparison correction. Unlike Study 1, in Study 2, experience seeking was significantly positively correlated to the score variable ($r = .16, p < .01$), reflecting longer time spent in the woods by those high in experience seeking, though this result did not survive multiple comparison correction.

New analyses were performed to compare the behaviors endorsed in the Risky Behavior Inventories with the behavioral measures, as seen in Table 3. Significant relations were found with the number of substances endorsed as having tried at least once with timeToFall specifically ($r = -.24, p < .01$). The number of negative substance use behaviors was found to be related to the boardJump ($r = .20, p < .05$) and score ($r = .26, p < .01$). These were all in the same direction as the self-reported sensation seeking relationships. However, it should be noted that none of these correlations survived multiple comparison correction. None of the sexual behavior measurements were correlated with the behavioral measures associated with sensation seeking.

When looking at demographic based regressions, a sex differences effect is again found in the same pattern as with Study 1. Females spent a greater amount of time standing on the edge

of the building ($\beta = -12.02, p < .001$) and the board ($\beta = -10.60, p < .001$). They were also quicker to approach the edge ($\beta = -7.19, p < .001$), board, ($\beta = -24.34, p < .001$), and to fall ($\beta = -14.08, p < .001$). Males spent a greater amount of time on the platform ($\beta = 8.08, p < .001$) and out of bounds ($\beta = 30.41, p < .001$). They were more likely to jump over the fence ($\beta = .58, p < .001$) and off the board ($\beta = 1.18, p < .001$) and again took more pictures ($\beta = 5.93, p < .01$). Finally, again in the Path task, males spent a greater amount of time in the forest ($\beta = 32.10, p < .001$). No regressions involving age were significant.

In the mediation models, again the only questionnaire variable with a significant interaction was the video game experience and score variable ($\beta = 29.45, p < .05$) with risk seeking, but did not remove the main effect of risk seeking ($\beta = 3.87, p < .001$). Adding sex as a regressor into the risk seeking models removed the main effect of risk seeking on boardZone, but otherwise did not change the main effects found in Study 2.

Table 2

Means, standard deviations, and correlations with confidence intervals of Study 2 behavioral measurements and the SSPTS and SUPPS-P sensation seeking scores.

Variable	<i>M</i>	<i>SD</i>	Risk Seeking	Experience Seeking	SUPPS-P Sensation Seeking
Risk Seeking	13.38	3.87			
Experience Seeking	19.86	2.79	.23** [.12, .34]		
SUPPS-P Sensation Seeking	11.36	2.45	.54** [.46, .62]	.38** [.27, .47]	
edgeZone	50.37	29.04	-.16** [-.27, -.05]	.00 [-.11, .12]	-.10 [-.21, .01]
platformZone	24.79	19.42	.09 [-.02, .21]	.07 [-.05, .18]	.09 [-.03, .20]
boardZone	28.39	18.80	-.16** [-.27, -.05]	-.05 [-.16, .07]	-.16** [-.27, -.05]
outZone	35.16	42.78	.14* [.03, .25]	.03 [-.09, .14]	.20** [.09, .31]
fenceJump	0.90	1.37	.12* [.00, .23]	.03 [-.08, .14]	.11 [-.00, .22]
boardJump	1.41	1.48	.21** [.10, .32]	.05 [-.07, .16]	.23** [.11, .33]
picsTaken	20.55	19.17	.09 [-.03, .20]	-.05 [-.17, .06]	.08 [-.03, .19]
timeToEdge	9.77	12.69	-.13* [-.24, -.02]	-.07 [-.18, .04]	-.21** [-.32, -.10]
timeToBoard	27.86	35.20	-.26** [-.36, -.15]	-.06 [-.18, .05]	-.31** [-.41, -.20]
timeToFall	33.65	33.84	-.32** [-.41, -.21]	-.08 [-.19, .03]	-.33** [-.43, -.22]
score	97.21	67.46	.22** [.11, .32]	.16** [.05, .27]	.26** [.15, .36]
endZoneTime	24.52	13.46	.08 [-.03, .19]	.10 [-.01, .21]	.13* [.02, .24]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate

the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$, uncorrected for multiple comparison. Bolded values reflect $p < .05$ following the Holm-Bonferroni method of multiple comparison correction.

Table 3

Means, standard deviations, and correlations with confidence intervals of Study 2 behavioral measurements and the RBI Substance Use Reports.

Variable	<i>M</i>	<i>SD</i>	Substances Experimented	Substance Behaviors
Substances Experimented	1.34	1.46		
Substance Behaviors	1.57	2.27	.69** [.59, .78]	
edgeZone	50.37	29.04	-.12 [-.30, .06]	-.11 [-.28, .07]
platformZone	24.79	19.42	-.05 [-.23, .14]	.04 [-.15, .22]
boardZone	28.39	18.80	-.10 [-.28, .08]	-.14 [-.31, .04]
outZone	35.16	42.78	.12 [-.06, .29]	.15 [-.03, .32]
fenceJump	0.90	1.37	.17 [-.01, .34]	.13 [-.05, .30]
boardJump	1.41	1.48	.10 [-.08, .28]	.20* [.02, .37]
picsTaken	20.55	19.17	-.06 [-.24, .12]	.02 [-.16, .20]
timeToEdge	9.77	12.69	-.11 [-.29, .07]	-.12 [-.29, .06]
timeToBoard	27.86	35.20	-.18 [-.35, .00]	-.16 [-.33, .02]

timeToFall	33.65	33.84	-.24** [-.40, -.06]	-.15 [-.32, .03]
score	97.21	67.46	.14 [-.04, .31]	.26** [.08, .42]
endZoneTime	24.52	13.46	.01 [-.17, .19]	.14 [-.04, .31]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$, uncorrected for multiple comparison. Bolded values reflect $p < .05$ following the Holm-Bonferroni method of multiple comparison correction.

Discussion

Hypothesis 1 was met, in that many of the results found from Study 1 were consistent with those found again in Study 2, despite having a significantly smaller total N value. While this is promising for some of the variables, it does call into question why some were now less meaningful, and if it was just a matter of the lower participant count. Additionally, the Score variable representing time spent in the forest during the Path Task, intended originally as a measure of experience seeking, in study 2 was now found to be associated with risk seeking, though this did not survive multiple comparison correction.

For Hypothesis 2, while some relations were found between the Substance Use RBI measurements and the emergent behavioral measures, these did not survive multiple comparison correction and should thus be considered carefully. The relationship between the timeToFall variable and number of substances experimented with may be due to risk devaluation as seen in sensation seeking. Meanwhile, many of the behavioral substance use questions are related to goals and work (“Have you ever gone to school / work while using a substance”, “Do you often

take a substance first thing in the morning”, etc.). This may reflect the lack of goal-directed behavior as seen in the Score variable of the path task, prioritizing one’s motivation over external goals and pressures. However, it is also discouraging that none of the sexual behavior measurements were significant, given its usual relation to sensation seeking. Again, it should also be stated that all relations were still relatively small in magnitude and had a high amount of variance, with sex assigned at birth also interacting with the behaviors in the tasks.

The suggestive but limited results of Study 2 raised further questions concerning the validity of the task and whether any improvements could be made to decrease noise and enhance validity and replicability. These concerns prompted me to examine task performance in VR spaces, following the lead of similar studies of risky behavior that showed a benefit from VR. I further hypothesized that performing the City and Path Task in a VR space would increase immersion for participants and thus enhance ecological validity of the tasks.

STUDY 3 – VR TASKS

Description

Study 3 repeated the procedures for Group 2 in Study 2 but with the City and Path tasks presented as VR tasks. As in Study 2, I measured the relation between behavioral measurements in the City and Path tasks and the SSPTS and RBI. This modification involved changing some of the components of the task in Unity to work in a VR space and using an Oculus Quest 2 for administration of the City and Path tasks. The remainder of the questionnaires were still answered on a standard computer. A test-retest reliability manipulation was added to measure if there were any changes in behavior for the tasks 4 weeks after the initial visit. These follow-up visits only included the emergent behavior tasks themselves, not the questionnaires.

Hypotheses

I hypothesized that the movement of the task to VR would increase the strength of the relationships with risk and experience seeking in the emergent tasks. This increased strength would result from the increased immersion of the VR space leading to greater arousal and ecological validity, enhancing each individual participant's natural inclinations. To be specific, I hypothesized that individuals high in sensation seeking would perform the sensation seeking-based behaviors more frequently than the non-VR versions, while those low in sensation seeking would be less inclined to perform sensation-seeking based behaviors.

The hypotheses for study 3 can be summarized as:

H1: Relations between emergent task behaviors and self-reported sensation seeking and health risk behaviors will be greater in the VR versions of the task compared to the results from the computer-based tasks in study 1 and 2.

H2: Individuals high in sensation seeking will be more likely to engage in sensation seeking behaviors in the task and those low in sensation seeking will be less likely to engage, decreasing variance in the behavioral measurements of the tasks.

Method

Participants

A power analysis was run based on the prior primary results from Study 1 and 2 with the hopes of having slightly greater validity and significance for the current study. This was done in part because the limitations of individual participant running and the VR task requirements itself would have a smaller n. This analysis was run using the “pwr” R-package to identify the ideal number of participants. Based on the strongest relations found previously ($r=.3$), a significance level of .05, a desired power of .8, and completing a two-sided alternative hypothesis, it was found that 85 participants would be needed. By the experiment’s conclusion, due to difficulties in recruitment, attrition in the test-retest condition (6), motion sickness (2), being uncomfortable with the questions in the survey (1), and data loss due to administrator error (1), the final participant count was under our desired threshold of 85, with a final n of 74. This n value with the same hypothesized $r = .3$, significance of .05, with a two-sided alternative hypothesis resulted in an actual power of .75 for this study.

Participants were again recruited using students in PSY 100 and PSY 250 classes at Colorado State University in compliance with their research requirements for those classes. A subset of the participants entered into a test-retest version of the procedure, only requiring them to return 4 weeks later to run through the VR tasks again for additional credit ($n = 36$). As in studies 1 and 2, the sample primarily consisted of white young adults between the ages of 18-22. Inclusion criteria consisted of requiring participants to be over the age of 18 and for this study I

also excluded individuals who indicated or had concerns about experiencing motion sickness or epilepsy when in a VR environment.

Materials

The survey portion of the experiment was again collected using Qualtrics, and the Emergent Tasks were redesigned to be compatible in VR using an Oculus Quest 2. The VR tasks were meant to be as like the original computer-based tasks as possible, but with VR enabled head movement and controls meant to work with the Oculus Quest 2. The VR implementation allowed the participant being able to view the simulation space with full 360-degree camera movement using the Oculus headset and moving their head. Controls were placed on handheld controllers to allow for the same controls as with previous versions. The Quest 2 left thumb stick was used to move the participant laterally in the task, but participants needed to turn their head to rotate. The “run” button had to be removed but with the addition of the joystick, it was now possible to set the “run” speed to the maximum speed of the joystick and instruct the participants to only press it lightly to “walk” instead. The “jump” button was bound to the right trigger finger and the “take picture” button was bound to the A button on the right controller. Participants could see where their hands were in the space, visualized by simple 3D hands, but did not have any other motion controls included in the tasks.

Rather than being in a larger computer laboratory space as with the previous tasks, this version was moved to a smaller lab space fit for VR use in a 4-meter x 4-meter space, and participants were only run individually rather than several at once. This area provided enough space to allow full body movement in the task, but with additional movement being handled by the controllers when needed. If reaching the end of the VR space, the Quest 2 would first become

red to indicate you were leaving the VR boundary, then become transparent if movement persisted, giving them a view of the room around them to prevent injury.

Outside of the main changes in putting the tasks into a VR space, the following task and questionnaire designs were also changed as follows:

1. A simpler “number of falls” variable was collected in addition to the more specific jumps participants could make which were measured before.
2. After pilot testing, I found that participants in the VR City Task were able to move to areas previously inaccessible in the computer-based version of the game through the more precise body movements and control VR allowed, such as climbing down the skyscraper slowly window by window. For this reason, I added another variable to be measured in the City Task, VRInZone, which was meant to simply count the entirety of the time spent by the participant in the main area on the top of the building. Thus, it was a reverse measurement of their time spent outside of this region and in any area, including those off the building from falling or jumping, or in the previously inaccessible areas in totality. The other variables remained unchanged.
3. Similarly, their improved movement also allowed some participants in piloting to escape the forest in the Path Task altogether, but this would result in them falling off the map for the rest of the trial. Invisible walls were added to the extremes of the perimeter to ensure this would not happen.
4. In the Path Task, I decided to make a clearer message at the end of the path that participants were now free to explore should they want to. This was meant to allow for the option of individuals who had a goal-directed mindset and immediately went to the house first to understand they can explore now should they choose to.

5. The survey included a short 4-item questionnaire on suicidal thoughts and behaviors, to see if endorsement of these behaviors was related to task behavior, similarly to the substance use RBI questions in Study 2. These were trichotomous questions concerning reports of suicidal behaviors and frequency. For example: “Have you ever thought that you would be better off dead?” with the responses: “Yes, within the last year”, “Yes, more than a year ago”, and “No, never”. The full questionnaire will be available in Appendix C.
6. A few questions in the custom questionnaire on the survey were added specifically to pertain to VR use, i.e. “Have you ever used VR before?” for use again in moderation models., again available in Appendix C
7. The participant’s view was cast to a nearby computer where the administrator for the experiment could see what they were seeing and help talk them through the task if they encountered any difficulty. These castings were also recorded to verify the accuracy of the measurements being calculated by the task programs themselves.

Procedure

The study began with the administrator greeting the participant, and before beginning the study confirming their identity, and requesting verbal assent that the individual was both over 18 years of age and had no concerns about motion sickness or epilepsy due to video game or VR use. Once verbalized, the participant read the online consent and was walked through it with the administrator, followed by the administrator inputting their Participant ID number directly. Participants were also reminded if they had signed up to the test-retest condition that they would be notified again in 4 weeks to return and undergo the VR tasks once more. After this the participants completed the Qualtrics survey for, on average, ~30 minutes.

Meanwhile, administrators set up the Oculus Quest 2 for running the tasks as well as began casting the Quest 2 view to their nearby lab laptop. The tasks were added as individual apps to the Quest 2 itself for ease of administration. The instruction screen was identical to those used in the computer-based tasks, but in a VR environment and with the controls changed to those used in the VR tasks. Once ready, the participants were fit for the headset and then were walked through the controls by the administrator. They would then read the instructions for and completed the City Task over a period of 5 minutes. Administrators were advised to only engage with the participants if they had clearly encountered an error and needed help or clarification about the controls. After completing the City Task, the participants removed the headset, returned to the computer, and answered the follow up questions pertaining to the City Task while the Administrator set up the Path Task, following the same procedure as for the City Task. Once the participants finished the follow up questions after the Path Task, they were either debriefed by the administrator or reminded again that they would be returning in 4 weeks to complete the retest part of the experiment.

Procedures for the retest phase of the experiment were the same, but only included the VR tasks. After completion of the retest phase participants were finally debriefed by the administrator.

Data Analysis Plan

All analyses were again completed using R (R Version 4.1.1, 2021). Similarly to Study 1 and 2, initial analyses would be Pearson correlations and linear regressions between the emergent behavior task measures and the self-report surveys of risk seeking and experience seeking in the SSPTS as well as the sensation seeking measurement of the SUPPS-P. These results could then be directly compared to those in Study 1 to assess reliability of the task across the VR and

computer-based versions of the task and compare to see if the VR Task better correlated to the self-report measures. In addition to the usual regressions, additional regressions were ran using sex assigned at birth and age to see if these were factors that may be affecting the emergent task behaviors themselves. Mediations would again be assessed on surviving pairs of variables again as well to ensure no significant interactions exist, including video game and VR use, hiking experience, immersion and arousal during the tasks, sex assigned at birth and age. Similarly to Study 2 additional correlations and linear regressions will be run on the measures of the Substance Use and Risky Sexual Behavior RBI's, also with Holm-Bonferroni multiple comparison corrections and checks for interaction with the additional questionnaire variables. Additionally, because the suicidal behavior questions are a series of four trichotomous questions pertaining to reported past suicidal thoughts and behaviors a MANOVA will be run on the four survey questions followed by post hoc one-way ANOVA's and further pairwise comparisons to see if there are any significant differences due to endorsement of suicidal behaviors. Finally, a test-retest comparison method was run between the emergent behavior variables measured at the initial visit and return visit for the group of participants in the test-retest condition, to assess correlation between the two time points. The results of the test-retest speak to the stability of the tasks in assessing the facets of sensation seeking over time.

Results

Initial Correlations

Initial analyses consisted of correlations run between measured SSPTS, SUPPS-P, and behavioral measurements in the City and Path tasks, as with the previous studies. I examined correlations separately for participants first session and second session. When I examined the first session, I did not find many significant correlations, and most of the correlations that were

present differed in the direction of the relation found in previous experiments. The correlations for session 1 are presented in Table 4. The correlation between risk seeking and TimeToEdge ($r = .24, p < .05$) and TimeToFall ($r=.24, p < .05$) were significant, but now those high in risk seeking showed a higher time required to reach the zone than those low in risk seeking, opposite to the results in Experiments 1 and 2. The only other significant correlation was between the fenceJump measurement and the SUPPS-P measure of sensation seeking ($r=.24, p<.05$). After applying a Holm method multiple comparison correction, none of these significant relations survived correction.

Table 4

Means, standard deviations, and correlations with confidence intervals for initial visits only in Study 3 behavioral measurements and the SSPTS and SUPPS-P sensation seeking scores.

Variable	<i>M</i>	<i>SD</i>	Risk Seeking	Experience Seeking	SUPPS-P Sensation Seeking
Risk Seeking	12.95	3.82			
Experience Seeking	20.26	2.36	.34** [.12, .53]		
SUPPS-P Sensation Seeking	11.61	2.40	.55** [.36, .69]	.50** [.31, .66]	
falls	3.69	2.99	.10 [-.13, .32]	-.13 [-.35, .10]	-.08 [-.30, .15]
edgeZone	48.44	35.05	-.07 [-.29, .16]	.04 [-.19, .26]	.05 [-.18, .27]
platformZone	22.34	16.42	-.04 [-.26, .19]	.09 [-.15, .31]	.02 [-.21, .24]
boardZone	30.06	20.71	-.07	.01	-.02

			[-.29, .16]	[-.22, .24]	[-.24, .21]
outZone	38.55	44.48	-.16 [-.37, .07]	-.21 [-.42, .02]	-.17 [-.39, .06]
fenceJump	1.05	1.96	.22 [-.01, .42]	.15 [-.08, .36]	.24* [.01, .44]
boardJump	1.47	1.42	.16 [-.07, .38]	-.03 [-.26, .20]	.07 [-.16, .29]
picsTaken	17.78	10.59	-.14 [-.35, .09]	-.16 [-.37, .07]	-.19 [-.40, .04]
timeToEdge	28.21	27.28	.24* [.01, .45]	-.03 [-.25, .20]	-.04 [-.27, .19]
timeToBoard	45.95	35.20	-.01 [-.23, .22]	-.13 [-.35, .10]	-.09 [-.31, .14]
timeToFall	78.34	56.10	.24* [.01, .44]	-.01 [-.24, .22]	.06 [-.17, .28]
score	86.16	53.02	.09 [-.14, .31]	-.18 [-.39, .05]	.11 [-.12, .33]
endZoneTime	20.28	7.53	-.02 [-.25, .20]	-.13 [-.35, .10]	.06 [-.17, .29]
VRInZone	694.76	250.51	.04 [-.19, .27]	.04 [-.19, .27]	.00 [-.23, .23]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$, uncorrected for multiple comparison. Bolded values reflect $p < .05$ following the Holm-Bonferroni method of multiple comparison correction.

Correlation analyses between sensation seeking self-report measurements and performance in the second session in the test-retest group also revealed few significant correlations, as shown in Table 5. Specifically, there was a significant correlation between

fenceJump measurement in the City Task, and both Experience Seeking ($r = .49, p < .01$) and the SUPPS-P sensation seeking measurement ($r = .39, p < .05$). After applying a Holm-Bonferroni method multiple comparison correction, neither of these significant relationships survived correction.

I followed up on the correlation analyses by performing linear regressions for both the initial and second visit. These analyses revealed relations showing the same patterns as the correlations but again no relations survived multiple comparison correction.

Table 5

Means, standard deviations, and correlations with confidence intervals for intervals in repeat visits only in the Study 3 Retest condition behavioral measurements and the SSPTS and SUPPS-P sensation seeking scores

Variable	<i>M</i>	<i>SD</i>	Risk Seeking	Experience Seeking	SUPPS-P Sensation Seeking
Risk Seeking	12.95	3.82			
Experience Seeking	20.26	2.36	.34** [.12, .53]		
SUPPS-P Sensation Seeking	11.61	2.40	.55** [.36, .69]	.50** [.31, .66]	
falls	4.22	3.31	.18 [-.16, .48]	.12 [-.22, .43]	.02 [-.31, .34]
edgeZone	38.78	36.72	.00 [-.33, .33]	.01 [-.32, .34]	.05 [-.28, .37]
platformZone	19.21	17.92	-.01 [-.34, .32]	-.06 [-.38, .27]	.13 [-.21, .44]

boardZone	16.46	17.06	-.23 [-.52, .10]	-.17 [-.47, .17]	-.17 [-.47, .17]
outZone	56.63	49.98	-.18 [-.48, .16]	-.07 [-.39, .26]	-.17 [-.47, .17]
fenceJump	1.86	2.14	.28 [-.06, .56]	.49** [.19, .71]	.39* [.07, .64]
boardJump	1.64	1.22	.04 [-.29, .36]	-.01 [-.34, .32]	-.05 [-.37, .29]
picsTaken	25.44	20.33	-.13 [-.44, .20]	-.28 [-.56, .05]	-.15 [-.45, .19]
timeToEdge	13.29	11.16	.14 [-.20, .45]	-.11 [-.42, .23]	.00 [-.33, .33]
timeToBoard	40.19	52.02	.28 [-.05, .56]	-.11 [-.42, .23]	.13 [-.21, .44]
timeToFall	73.27	61.20	.18 [-.16, .48]	-.10 [-.41, .24]	-.10 [-.42, .24]
score	113.99	61.60	-.08 [-.40, .25]	.16 [-.18, .47]	.11 [-.22, .43]
endZoneTime	24.47	9.83	.16 [-.18, .47]	.19 [-.15, .49]	-.00 [-.33, .33]
VRInZone	542.99	279.99	.09 [-.25, .40]	-.12 [-.43, .21]	.05 [-.29, .37]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$, uncorrected for multiple comparison. Bolded values reflect $p < .05$ following the Holm-Bonferroni method of multiple comparison correction.

RBI Comparisons

I examined correlations between the RBI variables and the behavioral task measures as done previously in Study 2. Again, there were few significant relations, as shown in Table 6. Substances experimented with correlated with the picsTaken variable ($r=.28, p<.05$). Substance behaviors endorsed correlated with the timeToEdge ($r = .23, p <.05$) and timeToFall ($r = .25, p <.05$) variables. Again though, none of these relations survived multiple comparison correction. For risky sexual behavior, there was a strong negative relation found between the picsTaken variable and number of anal sex partners ($r = -.97, p < .01$), though it should also be noted that only a very small sample endorsed many of the behaviors on this section of the survey ($n = 5$).

Table 6

Means, standard deviations, and correlations with confidence intervals for initial visits only in Study 3 behavioral measurements and the RBI Substance Use Report

Variable	<i>M</i>	<i>SD</i>	Substances Experimented	Substance Behaviors
Substances Experimented	0.46	0.78		
Substance Behaviors	1.14	1.65	.21 [-.02, .42]	
edgeZone	48.44	35.05	.02 [-.21, .24]	-.07 [-.29, .16]
platformZone	22.34	16.42	-.02 [-.24, .21]	-.03 [-.26, .20]
boardZone	30.06	20.71	.07 [-.16, .30]	-.06 [-.28, .18]
outZone	38.55	44.48	-.03 [-.26, .20]	-.05 [-.28, .18]

fenceJump	1.05	1.96	-.03 [-.26, .20]	.04 [-.19, .27]
boardJump	1.47	1.42	-.13 [-.34, .11]	.01 [-.22, .24]
picsTaken	17.78	10.59	.28* [.05, .48]	.22 [-.01, .43]
timeToEdge	28.21	27.28	.06 [-.17, .28]	.23* [.00, .44]
timeToBoard	45.95	35.20	-.07 [-.30, .16]	.18 [-.05, .39]
timeToFall	78.34	56.10	.14 [-.09, .36]	.25* [.02, .45]
VRInZone	694.76	250.51	.01 [-.22, .24]	.00 [-.22, .23]
score	86.16	53.02	-.04 [-.26, .19]	.06 [-.17, .28]
endZoneTime	20.28	7.53	.02 [-.21, .25]	-.02 [-.24, .21]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$, uncorrected for multiple comparison. Bolded values reflect $p < .05$ following the Holm-Bonferroni method of multiple comparison correction.

Suicidal Behaviors and Additional Comparisons

For comparison to suicidal behaviors, I used a MANOVA to correct for multiple comparisons, looking at each of the behavioral measures in the tasks as the dependent variables and each of the four questions in the survey as independent variables, to determine if endorsement of any level of thought for any of these behaviors was related to the tasks. Question

2 (“Have you ever thought that you would be better off dead?”) did have a significant relationship at the level of the MANOVA ($F = 1.88, p < .05$), but none of the individual ANOVA post hoc tests were found to be significant.

Additional regressions were run to assess whether additional variables such as sex at birth and age and video game experience affected the results. Sex at birth was found to relate directly to the fenceJump variable, with males more likely to jump over the fence ($p < .05$). This effect was again lost after applying the Holm-Bonferroni method for correction of multiple comparisons. Age was not found to be significantly related to any of the emergent task variables.

Of the multilinear regression models using the custom questionnaire items such as VR and video game experience as additional variables onto the SSPTS variables, recent weekly amount video games played identified an effect on the fenceJump variable, with increased playing increasing the effect of Risk Seeking ($\beta = .561, p < .05$) which did not survive testing for multiple comparisons. Adding VR experience into the model similarly increased the Risk Seeking relation to the fenceJump measurement when participants had experience with VR games ($\beta = .471, p < .05$), but again this did not survive multiple comparisons. Meanwhile, incorporating how seriously the participants took the City Task removed the previously found significance with timeToEdge and timeToFall with longer times related to increased Risk Seeking. Applying sex at birth as a moderator variable also increased the greater jumps with higher risk seeking effect in males ($\beta = .489, p < .05$), while also interacting to remove the significance from the timeToEdge variable for Risk Seeking.

Test-Retest Reliability

When examining the test-retest reliability, another correlation was run to examine the relationship between the initial visit and time point 2. I set thresholds for reliability based on

prior literature (Hripcsak & Heitjan, 2002; DeVellis & Thorpe, 2021; Biedermann et al., 2024). .

Across all variables, reliability was found to range from acceptable (>.7) to unreliable (<.5) between the two visits. Specifically, the most reliable metrics were the boardZone, picsTaken, and VRInZone variables. Meanwhile the least reliable metrics between visits were the platformZone, outZone, timeToEdge, score, and endZoneTime variables. This indicates that the City Task includes a few reliable variables across multiple tests, but the Path Task showed poor reliability across multiple administrations. These findings are reflected in Table 7.

Table 7

Test-retest reliability correlations between scores on behavioral variables between the initial test and second visit for emergent behavior tasks

Variable	<i>r</i>
falls	.61
edgeZone	.62
platformZone	.32
boardZone	.79
outZone	.20
fenceJump	.55
boardJump	.56
picsTaken	.77

timeToEdge	.34
timeToBoard	.68
timeToFall	.53
VRInZone	.70
score	.35
endZoneTime	.22

Discussion

VR Task Behavioral Results

Unfortunately, the VR Task did not result in any improvements in efficacy of the emergent tasks, and both of our hypotheses for Study 3 were rejected. Where significant relations were found, they were occasionally in the opposite direction of the original effect found in the computer-based tasks (primarily for the timeToEdge and timeToFall variables), were often eliminated through additional moderator variables and most importantly never survived multiple comparison corrections. Given the already admittedly small effects found in Study 1 and 2 in the computer-based tasks, a slightly noisier methodology may have inserted too much variance for the task to provide meaningful interpretations. In addition, other methodological factors in the experiment may also have affected the result, as the final participant count was short of our desired n based on power analysis, for fairly small effects to begin with. While it is possible that running far more participants may have aided in identifying clear trends in the data, it is also quite possible that the VR tasks are unfortunately incompatible with the emergent tasks as they

stand. There are several possible reasons that VR failed to improve efficacy and instead appears to have weakened the results, such as individual differences in response to VR creating noise, social pressures during the study, and the intrinsic issues with VR as a methodology.

It is possible that the VR task was too noisy and washed out any potential results as I had seen in the computer-based versions. This may be due to individual differences in reaction to the VR environment, where it was either too engaging or had the opposite effect I had hoped for in terms of immersion depending on the participant. Based on anecdotal comments left by the participants in reaction to the tasks, some immediately turned the city task into a game. Meanwhile others stated they were never comfortable in the VR and essentially just bided their time while wearing the headset. The original justification for a VR version of the task was that increased immersion and ecological validity would increase the differences between high and low sensation seekers: VR would make the “risky” decisions appear riskier and the stimuli appear more exciting to high sensation seekers, while low sensation seekers would be more avoidant due to the increased closeness to reality and thus apparent danger or harm that could come from it. It is possible instead that by putting the task onto a VR headset it pushed the perception of the task fully into it being a “game” for the participants, and thus increased or decreased immersion based on the individual participant’s reaction. This further could cause the participants, even if reporting a greater sense of immersion, to have used the chance to engage in such risky activities without fear, thus having the opposite effect and putting low sensation seeking individuals closer in behavior to the high sensation seeking participants. Such variance in how the VR tasks may have been perceived may have made any consistent internal validity impossible due to the VR design itself.

Further, the change of lab environment and administration may have had an unfortunate effect onto the pressure being put onto the participants. Whereas in Study 1 and 2, participants completed the study on individual computers with privacy screens, with an administrator only in the corner, the VR Task administration was more intimate. The participants and administrator were the only ones in the room, who they could not see while using the headset, while they would be aware the administrator was always watching them and their view in the tasks, and that they were being recorded. The participants behavior thus may have been unduly altered due to the situation than they would have had while completing the computer task naturally and with more privacy, without an expectation of being recorded or immediately watched. These changes to the natural, emergent behavior the task is meant to elicit, either to be more restricted or riskier, may have washed out the expected effects of the task.

Finally, some evidence does also point to VR tasks not always being a benefit when in testing parameters. VR has been applied for delivery of several different measurements and even treatments in neuropsychological settings, but the findings have been mixed based on the type of measurement and setting (Bell et al., 2020; Geraets et al., 2022). The field and application of VR is still new in the field and requires much more validation and replication to begin to completely understand both its benefits and limitations. Virtual reality has found to in some cases reduce performance on cognitive tasks when compared to computer-based tasks, due to perceived and mechanical difficulty, as individuals may be less versed in how to easily move in a VR space and may also be intimidated by the prospect (Neguț et al., 2016). It is possible that some of the lengthier times to reach the risky areas found in the VR in high risk seeking individuals may better be explained by a confounding variable causing them to have greater difficulty in navigating the VR compared to other individuals. These concerns as well as the overall still open

literature on where VR improves outcomes for tasks may show that the emergent behavior tasks may not have been as suitable to VR in the first place, despite the improved immersion and apparent ecological validity.

Test-Retest Reliability

Though the results of the VR task themselves may be unreliable, we can review some trends through the test-retest assessment to see which variables may be more stable over time. The only assessments with greater than acceptable levels of reliability ($r > .7$) were time on the board, pictures taken, and staying in the main area and not exploring in the City Task. The pictures taken variable is not directly related to sensation seeking personality trait itself, though may reflect a separate personality variable altogether. It is possible that the desire to take several pictures could reflect neuroticism, compulsiveness, or goal-directed behavior, given that taking the “best picture possible” is the explicit goal of the task. Studies have found that personality traits such as neuroticism as well as compulsivity play a role in repetitive behaviors, even in the absence of control or purpose (Reuven-Magril et al., 2008; Oshio, 2018). The time on the board and in the main area of the task, and thus not exploring, may indicate that individuals who are not likely to explore off the building or stand on the board may not even consider doing so. Thus, these variables may be more static across time as they are less appealing or apparent to certain individuals.

For the other variables, particularly the least reliable variables, the behaviors reflected included standing on the platform, being out of bounds on the other buildings, and time to reach the edge the first time in the city task. For the platform, it is a small space with limited views, so it's possible that on the follow up attempt that participants had seen all they could from this vantage point and thus saw no need to stand there again, seen in the decreased mean for platform

time in the second visit. Alternately, it may be related to a greater amount of fence jumping seen in the follow up visit, as seen in the means for fence jumping increasing in the second visit, similar to how a greater amount of jumping off and being out of bounds was seen with less time on the edge in Study 1 and 2. For the outZone variable, with the greater amount out of bounds in the second visit, it's possible that some individuals only found out they could reach these areas later on in their initial visit. Then, once at the second visit, they already had this knowledge, allowing them to reach these areas more quickly and spend greater time there, reflecting a gain in task expertise. Finally and similarly for the time to Edge variable being reached much quicker on average at the second visit it may be that the exposure and “danger” of the edge had been removed by the second session through exposure at the first session.

To explain the poorest performing variables, it is quite possible that the measurements in the tasks are simply unreliable over time. Alternately, the poor reliability variables may be explained by habituation and sensitization effects, which can occur in both VR and behavioral tasks (Biedermen et al., 2024). Sensitization and habituation are well-studied phenomena occurring following repeated exposure to the same task, environment, or stimuli, and occur often in approach-avoidance experiments similar to the City and Path Tasks (Bernstein & Nietzel, 1974; Biedermen et al., 2024). Indeed, VR exposure therapy treatments using approach-avoidance like designs rely on this habituation over multiple visits to attain their effects (Guijar et al., 2019). Thus, it can be heavily implied that habituation effects exist for the identical instances of the City Task as well. The remaining variables which were between poor to acceptable may be due to a mix of these habituation and lack of ideation concepts, resulting in a middling reliability score.

Finally, it should be noted that both of the Path Task variables, score and endZoneTime, had low reliability. This can be seen in the second session with a much longer amount of time in the forest through the score variable, and a later time of arrival at the goal compared to the first session. This can most likely also be attributed to sensitization to the task from the first visit, where participants were more likely to approach the goal earlier. In the second visit, now knowing that they have an abundance of time to reach the goal, they were more likely to focus on exploration. Further, they may have had to go further into the forest, and thus away from the goal, in order to see new stimuli, as the task stimuli was identical at both visits. It may be possible to remedy this through randomization of placement of stimuli so novel stimuli would not require a further distance to find, or through randomizing the length of the path between sessions as other researchers have found using human VR elevated plus maze tasks (Biedermen et al., 2024). However, this may not be appropriate for the Path Task and could cause greater heterogeneity between participants during the task and may worsen the consistency of the task overall. Considerations like this should be made in refining the Path Task to better measure experience seeking.

GENERAL DISCUSSION

Overview

The three studies performed in this dissertation examined the potential and effectiveness of novel emergent behavior tasks that rely on intrinsic rather than extrinsic motivation to measure the sensation seeking personality trait behaviorally. While Study 3 failed in creating a valid utility for such measurement, the considerations that can be made for Study 1 and 2 are still present and can hopefully lead to more refinement for future versions of this task. The emergent behavioral sensation seeking tasks, the City and Path Tasks, thus still have promising prospects for a measure of the intrinsic motivation of sensation seeking personality trait. Here I consider their relationship to self-report measures and risky behaviors, consider limitations, potential improvements, and justifications for the tasks.

Relations to Self-Report Measures

The emergent behavioral tasks were modestly well correlated with measures of sensation seeking personality trait, through the SSPTS and SUPPS-P. The similar correlations between the SUPPS-P and SSPTS on Risk Seeking imply that both, at least in the context of the emergent tasks, appear related to the intrinsically motivating risky decision making included as questions on both surveys. This could mean that the task is robust to the intrinsic motivation being measured in both scales, implying construct validity. An alternative would be that the SUPPS-P may be closer in similarity to the risk seeking as measured by the SSPTRS as may have been expected. Further, it may be that the experience seeking dimension of the SSPTS is better delineated from risk seeking at least in the context of behavioral motivation from the SUPPS-P.

Further investigation on the comparison of the tasks and additional metrics of personality and sensation seeking may better elucidate the convergent validity between the tasks and scales.

Through both Study 1 and 2, the significant findings of relationship to the sensation seeking self-report measures implies a decent internal validity to the City Task specifically. Given the replicability across both studies and similar results, it can be assumed that the task can be continued in further replications and in subsequent versions meant to parse out understanding of sensation seeking. It may be possible to further identify related constructs to high or low sensation seeking, such as including additional measures of reward sensitivity, novelty seeking, approach-avoidance and other such constructs.

Further, it is encouraging that these emergent tasks, unlike some of the other common measures of sensation seeking like the BART, do not appear to be meaningfully associated to impulsivity at all and thus stand as tasks meant to isolate sensation seeking personality trait specifically. Previous behavioral tasks that were meant to measure sensation seeking have been found to often conflate their results with impulsivity in addition to sensation seeking (Hanoch, Johnson, & Wilke, 2006; Reynolds et al., 2006; Benjamin & Robbins, 2007; Bornovalova et al., 2009; Botdorf et al., 2017). This implies greater discriminative validity than the BART and Stoplight tasks, and thus may be closer to the original construct of sensation seeking and the intrinsic motivation of sensation seekers. In regard to theory, this may better identify the critical difference in high sensation seeking to be reliant on specifically intrinsic rather than extrinsic motivation.

Relations to Risky Behaviors

Both tasks had some relations to risky behavior directly, though this will need further examination to gain clarity. Substance use experimentation and endorsement of multiple

substance use behaviors was found in Study 2, though these results did not survive multiple comparison correction. Risky sexual behavior appeared to never have a strong relation to the task, which may be an aspect of the sample of college students in our samples or due to risky sexual behavior being too far removed from any relation to the risks taken in the task. Suicidal behaviors were examined in Study 3 and had one significant MANOVA for question two in our suicidal behaviors questionnaire, “Have you ever thought that you would be better off dead?” implying suicidal ideation. However, this measure did not have any significant post hoc one-way ANOVAs and due to the questionable nature of the results of Study 3 itself, should be considered carefully. In future directions for direct behaviors related to the task, it may behoove to look more carefully at suicidal behavior, particularly ideation, in a computer-based version of the tasks, and focus on replicating substance use behaviors as well. It may also be worth considering other factors of the RBI, such as extreme sports or gambling.

Task Improvement

While modest success with the tasks was found, both the City and Path Tasks can be improved through further refinement, such as by paring down to the most efficacious variables. Of note, the specific jump variables (boardJump and fenceJump) and time to risky area variables (timeToBoard and timeToFall in particular) seem to be the most efficacious and resistant to moderation. Future versions of this task may benefit from focusing analyses more specifically onto these four variables to create less exploratory based noise in analysis. The Path Task may still have utility for measuring experience seeking personality trait as well, but this is less concrete given the conflicting results of each study. Further refinements may be needed to create a task which more validly measures experience seeking with the absence of risk, though this may

be difficult given the intrinsic necessity of a goal and thus risk of not reaching the goal when measuring goal-directed behavior.

It would appear due to the results of Study 3 that this task may perform best only when in a computer-based format as opposed to VR, even with the higher ecological validity supplied by the VR immersion. As discussed in that experiment's discussion section, it may be that the noise provided by the task being in VR or the conditions of the experiment itself, which may not be able to be addressed in a VR experiment methodology. For the time being, it would seem prudent to instead focus on the computer-based tasks and improving validity and reliability there rather than focusing on VR implementations of the tasks. Improvements could be made to the tasks themselves, graphically or mechanically, or perhaps consideration of alternative confounding variables that may be accounting for some of the high variance with the tasks.

Also, while the City Task appears to be reproducible based on the comparisons between Study 1 and 2, the Path Task showed different patterns of relationship with risk and experience seeking in the two studies. Thus, the Path Task may need further refinement to ensure it is accurately measuring experience seeking in particular. Whether this can best be accomplished through a major or minor alteration of the tasks remains to be tested. The most likely way to do so would be to alter the goal of the task to create a situation where individuals can choose to explore without a greater feeling of risk. This will be a difficult line to walk and thus may need a few alterations before being a true reliable measurement of experience seeking specifically. Alternately, scoring the task more on specific places of interest found in the forest rather than a general "exploration" score may be a better measurement of the behaviors associated with experience seeking.

Justification and Potential Usage for Tasks

The initial justification and use of the tasks was to be able to provide a behavioral metric examining the intrinsic motivation towards risky activity or stimulating experiences as opposed to measures of impulsivity. As they stand currently, it should be stated that these are significant findings with small effects, and with a high amount of variance, and thus may only show a modest improvement over self-report assessments of sensation seeking. However, they could continue to be a useful tool in identifying correlated behaviors to sensation seeking personality trait regardless. The tasks were originally designed as a research tool to understand intrinsic motivation in sensation seekers, but it had also been considered for use in prevention if the findings of the task could be implemented as such. The intent for the task over time has been towards being another tool used for prevention of negative health behaviors in identifying individuals who are at greater risk due to scoring high in sensation seeking personality trait.

While standing on its own, it is unlikely these tasks could be used in isolation, and absolutely should not be considered for diagnostic criteria. Rather, it is the hope that these tasks could be used in conjunction with self-report measurements and clinical observations to provide a holistic view to improve patient outcomes. This could be through implementation in a battery of tests used to identify individuals at risk of negative health consequences. It could also be used in larger machine learning models in large datasets with predictive capabilities from a high number of predictors.

The population that may benefit the most from this task could possibly be adolescents. Adolescents are particularly vulnerable to the negative health risks of sensation seeking due to the differential maturation rates of the reward system and cognitive control during adolescence, with lower cognitive control and higher preference for reward (Steinberg, 2008; Geier & Luna,

2009). High sensation seeking adolescents can thus be found to have distinct neural activity during reward processing when at this stage (Chein et al., 2011; Cservenka et al., 2013). This can lead to high rates of substance use and suicidal behaviors in adolescents high in sensation seeking personality trait (Ortin et al., 2012; Quinn & Harden, 2013). Adolescents also have low reliability with self-report assessments, particularly of substance use, and most self-report surveys rely on at least a 5th grade reading level which at risk individuals may not have (Stanton et al., 1996; Chan & Schmitt, 1997; Elgar et al., 2005; Williams & Nowatzki, 2005). Adolescents have been shown however to respond better and eliminate some of these limitations through behavioral tasks and engaging visual presentation rather than self-report and pen and paper tests (Chan & Schmitt, 1997; Botdorf et al., 2017). This means creating a behavioral task capable of adequately measuring sensation seeking in adolescents outside of self-report surveys, and ideally which measures the intrinsic motivation found in sensation seeking alone rather than conflating with impulsivity, could lead to significantly improved prevention outcomes for adolescents high in sensation seeking. Creating such a task may also have benefits to younger children, who have similarly increased incentive motivation (though to a lesser degree) as adolescents (Galván, 2010; Luciana & Collins, 2012). However, given that self-reported sensation seeking and several aspects of related health risk behaviors do not emerge until adolescence, it is possible that the emergent tasks may also not pick up on these differences (Steinberg, 2010; Luciana & Collins, 2012). However, if these tasks do in fact predict sensation seeking, or even longitudinally predict later engagement in health risk behaviors, this could be a hugely beneficial tool for prevention of negative health outcomes. While these emergent behavior tasks have not been tested in adolescents or younger children before, I hope that the evidence from the previous studies shows that it has promise in working towards being such a task.

Limitations and Considerations

Both the City Task and Path Task have significant limitations which should be carefully considered. The findings of Study 3 imply that it is necessary to be quite careful in modifying the experiments to prevent idiosyncratic responses by participants to the tasks that add noise and wash out the actual emergent behaviors. Thus, though greater ecological validity would be a boon, it may not be attainable at this time, and the tasks themselves must be modified carefully if in hopes to improve. Having better graphics or performance may improve both tasks in terms of immersion for the participants without going as far as using VR.

Another limitation is the populations comprising the samples for the three studies. All studies were conducted on students in undergraduate psychology courses at a university in Northern Colorado. Because of this, the sample did not reflect the larger US population and consisted mostly of white young adults. Further, limitations could exist due to not having greater exclusionary criteria. While mediation models concerning video game and VR usage did not produce strong effects in the samples, it is still possible that excluding participants based on naivety or significant experience with video games may alter the results. Alternately, if this university student population did not include the full range of sensation seeking found in the broader population, the differences between those high and low in sensation seeking may have been diluted. Indeed, future research could consider enrolling only those high or low in sensation seeking to identify more pronounced effects. Additional experiments with more selective criteria or a more diverse population may be desirable to understand the full degree of generalizability of the tasks.

Further, we must remember that all of the results of from these tasks consisted of small effects with a high amount of variance. While the addition of these behavioral measures may be

a slight improvement over self-report surveys alone in some cases, it will remain just that, slight, for now. It may still be possible to alter the tasks to better reduce variance, but again care must be taken when altering the tasks too greatly. It is also possible that other confounding variables may be playing a greater role in the task than thought previously. If these could be identified and included in the survey portion, they may increase efficacy of some of the variables in measuring sensation seeking. It is hoped that modest, careful improvements to the tasks can continue to increase their efficacy in future studies.

Conclusion

I created two novel tasks measuring emergent behavior (self-directed and non-goal related behaviors) that are sensitive to intrinsic motivation for highly exciting stimuli and risk in order to provide a behavioral measure of the sensation seeking personality trait. These tasks have proven to be modestly successful in measuring sensation seeking in this regard and show promise for continued improvements to be used as a behavioral task or even prevention screening technique for those at risk of negative health risk behaviors such as adolescents. Further investigation and refinement of the tasks is warranted to achieve such a goal, through additional study using adolescents as a population, identifying related neural correlates such as through fMRI, and further refining the dimensions of the tasks. This dissertation serves to present these tasks, and the idea of emergent behavioral designs as a whole, as a valid and valuable addition to psychological science, including the realms of sensation seeking, risky behavior, and substance use.

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APPENDIX A – STUDY 1 QUESTIONNAIRE

Q219 Participant ID

Q221 What is your date of birth? (mm/dd/yyyy)

(Used to calculate age at the time survey was completed for age comparison purposes)

Q223

How do you define your Race?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose all that apply}

- American Indian or Alaska Native (1)
- Asian (2)
- Black or African American (3)
- Native Hawaiian or Other Pacific Islander (4)
- White (5)
- Another (6) _____
- Do not wish to respond (7)

Q225

How do you define your Ethnicity?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose one}

- Hispanic or Latinx (1)
 - Not Hispanic or Latinx (2)
 - Another (3) _____
 - Do not wish to respond (4)
-

Q227

How do you define your Sexual Orientation/Preference?

(We are attempting to better understand relations between sexual orientation/preference and behavior)

Write in:

Q229 Do you identify as part of the LGBTQ+ Community?

- Yes (1)
 - No (2)
 - Do not wish to respond (4)
-

Q231

Choose a number that best describes your Sexual Orientation/Preference:

(We are attempting to better understand relations between sexual orientation/preference and behavior)

- Exclusively Homosexual 1 (1)
 - 2 (2)
 - 3 (3)
 - Bisexual 4 (4)
 - 5 (5)
 - 6 (6)
 - Exclusively Heterosexual 7 (7)
 - Asexual (8)
 - Pansexual (10)
 - Do not wish to respond (12)
-

Q243 How do you define your Gender Identity?

Note that Cisgender terms Cis Man and Cis Woman denote individuals whose sense of gender identity corresponds with the sex assigned to them at birth.

(We are attempting to better understand relations between gender identity and behavior)

{Choose all that apply}

- Agender (1)
- Androgynous (2)
- Cis Man (3)
- Cis Woman (4)
- Demiboy (30)
- Demigirl (31)
- Gender Fluid (5)
- Gender Non-Binary (8)
- Gender Non-Conforming (10)
- Gender Fluid (11)
- Gender Non-Binary (15)
- Gender Non-Conforming (16)
- Genderless (29)
- Genderqueer (17)
- Man (18)
- Third Gender (19)
- Trans Man (20)

- Trans Woman (21)
 - Transgender (22)
 - Transperson (23)
 - Two Spirit (24)
 - Woman (25)
 - Other (26) _____
 - Choose not to respond (27)
-

Q245 What was the sex assigned to you at birth?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose One}

- Male (1)
- Female (2)
- Intersex (5)
- Another (3) _____
- Do not wish to respond (4)

Mental Health 1 Have you ever been diagnosed with and/or treated by a professional for any of the following conditions? Please check all that apply:

- Depression (1)
 - Anxiety (2)
 - Bipolar Disorder (3)
 - Post-Traumatic Stress Disorder (PTSD) (4)
 - Obsessive Compulsive Disorder (OCD) (5)
 - Attention Deficit and Hyperactivity Disorder (ADHD) (6)
 - Schizophrenia and/or any other Psychosis Spectrum Disorder (7)
 - Borderline Personality Disorder (8)
 - Antisocial Personality Disorder (9)
 - Other Personality Disorder (10)
-
- Substance Misuse and/or Addiction (Alcohol and/or Drugs) (11)
 - Other Addiction (e.g., internet, gaming, sexual, gambling) (12)
-
- Anorexia, Bulimia, and/or any other Eating Disorder (13)
 - Insomnia and/or any other Sleep Disorder (14)
 - Other Mental Health Condition (15)
-
- Learning Disability (16)

None of the Above (17)

Mental Health 2 Which of the following conditions are you *currently* diagnosed with and/or receiving treatment by a professional for? Please check all that apply:

- Depression (1)
 - Anxiety (2)
 - Bipolar Disorder (3)
 - Post-Traumatic Stress Disorder (PTSD) (4)
 - Obsessive Compulsive Disorder (OCD) (5)
 - Attention Deficit and Hyperactivity Disorder (ADHD) (6)
 - Schizophrenia and/or any other Psychosis Spectrum Disorder (7)
 - Borderline Personality Disorder (8)
 - Antisocial Personality Disorder (9)
 - Other Personality Disorder (10)
-
- Substance Misuse and/or Addiction (Alcohol and/or Drugs) (11)
 - Other Addiction (e.g., internet, gaming, sexual, gambling) (12)
-
- Anorexia, Bulimia, and/or any other Eating Disorder (13)
 - Insomnia and/or any other Sleep Disorder (14)
 - Other Mental Health Condition (15)
-
- Learning Disability (16)

None of the Above (17)

SSPT

The following scale consists of a series of statements regarding preference for engaging in new or exciting tasks. For each of the following items, you will be asked to indicate how much you agree or disagree with the statement. There are no right or wrong answers and we ask that you respond honestly.

SSPT1 I enjoy participating in unsafe activities.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT2 I don't enjoy trying new things.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT3 I think it is important to try as many new things as I can.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT4 I do things even if I know that doing them will get me in trouble.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT5 I love challenging myself with new and interesting tasks.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT6 I think that excitement is more important than safety.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT7 I have the most fun when I am doing risky or dangerous things.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT8 I rarely do things that seem risky.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT9 I like to experience anything and everything I can.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT10 I like to explore new areas.

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

BIS – 15

DIRECTIONS: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and mark the

appropriate circle on the right side of this page. Do not spend too much time on any statement.
Answer quickly and honestly.

	Rarely/Never (1)	Occasionally (2)	Often (3)	Almost Always/Always (4)
I plan things carefully. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do things without thinking. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't "pay attention". (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I concentrate easily. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I save money on a regular basis. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I "squirm" at plays or lectures. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a careful thinker. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I plan for job security. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I say things without thinking. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I act "on impulse". (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get easily bored when solving thought problems. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I act on the spur of the moment. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I buy things on impulse. (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am restless at the theater or lectures. (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I plan for the
future. (15)



DERS

Directions: The following statements inquire about your thoughts and feelings in a variety of situations. Please respond as honestly and accurately as you can.

DERS1 I pay attention to how I feel.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS2 I have no idea how I am feeling.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS3 I have difficulty making sense out of my feelings.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS4 I am attentive to my feelings.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS5 I am confused about how I feel.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS6 When I'm upset, I acknowledge my emotions.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS7 When I'm upset, I become embarrassed for feeling that way.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS8 When I'm upset, I have difficulty getting work done.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS9 When I'm upset, I become out of control.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS10 When I'm upset, I believe that I will remain that way for a long time.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS11 When I'm upset, I believe that I'll end up feeling very depressed.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DER12 When I'm upset, I have difficulty focusing on other things.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DER13 When I'm upset, I feel ashamed with myself for feeling that way.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DER14 When I'm upset, I feel guilty for feeling that way.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS15 When I'm upset, I have difficulty concentrating.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS16 When I'm upset, I have difficulty controlling my behaviors.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS17 When I'm upset, I believe that wallowing in it is all I can do.

- Almost never (1)
 - Sometimes (2)
 - About half the time (3)
 - Most of the time (4)
 - Almost always (5)
-

DERS18 When I'm upset, I lose control over my behaviors.

- Almost never (1)
- Sometimes (2)
- About half the time (3)
- Most of the time (4)
- Almost always (5)

TIPI

Here are a number of personality traits that may or may not apply to you. Please indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

	Disagree strongly (1)	Disagree moderately (2)	Disagree a little (3)	Neither agree nor disagree (4)	Agree a little (5)	Agree moderately (6)	Agree strongly (7)
Extraverted, enthusiastic (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critical, quarrelsome (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dependable, self- disciplined (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious, easily upset (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open to new experiences, complex (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reserved, quiet (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sympathetic, warm (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disorganized, careless (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calm, emotionally stable (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conventional, uncreative (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SUPPS-P

Q119 Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. Be sure to indicate your agreement or disagreement for every statement below.

Q1 I finish what I start.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q2 I generally like to see things through to the end.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q3 I like to stop and think things over before I do them.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q4 I tend to act without thinking when I am really excited.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q5 I tend to lose control when I am in a great mood.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q6 I tend to value and follow a rational, "sensible" approach to things.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q7 I usually think carefully before doing anything.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q8 My thinking is usually careful and purposeful.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q9 I quite enjoy taking risks.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q10 Once I get going on something I hate to stop.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q11 Others are shocked or worried about the things I do when I am feeling very excited.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q12 Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q13 Unfinished tasks really bother me.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q14 I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q15 When I feel rejected, I will often say things that I later regret.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q16 I would like to learn to fly an airplane.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q17 When I am in great mood, I tend to get into situations that could cause me problems.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q18 I would enjoy the sensation of skiing very fast down a high mountain slope.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q19 When I am upset I often act without thinking.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q20 When I feel bad, I will often do things I later regret in order to make myself feel better now.

- Agree Strongly (1)
- Agree Some (2)
- Disagree Some (3)
- Disagree Strongly (4)

Custom Questionnaire for Emergent Behavioral Tasks

vidgame1 Have you ever played video games?

- No (1)
 - Yes (2)
-

vidgame2 How many hours per week do you currently play video games?

- 0 (1)
 - 1-5 (2)
 - 6-10 (3)
 - 11-15 (4)
 - 16-20 (5)
 - 21 or more (6)
-

vidgame3 What types of video games do you currently play? Check all that apply.

- App-based games (1)
 - Console games (2)
 - Computer games (3)
-

vidgame4 Think about a time in your life when you were playing video games on a regular basis, how many hours per week were you playing video games when you were playing the most?

- 0 (1)
 - 1-5 (2)
 - 6-10 (3)
 - 11-15 (4)
 - 16-20 (5)
 - 21 or more (6)
-

vidgame5 What types of video games did you play at that time? Check all that apply.

- App-based games (1)
 - Console games (2)
 - Computer games (3)
-

heights How often do you participate in activities with exposure to heights?

- Never (1)
 - A couple of times a year (3)
 - Once a month (4)
 - Once a week (5)
 - Multiple times per week (8)
-

fear Do you have a fear of heights?

No (1)

Yes (2)

motion Do you frequently experience motion sickness?

No (1)

Yes (2)

hike Do you often go hiking or backpacking?

No (1)

Yes (2)

PARTICIPANTS COMPLETED CITY TASK AT THIS TIME

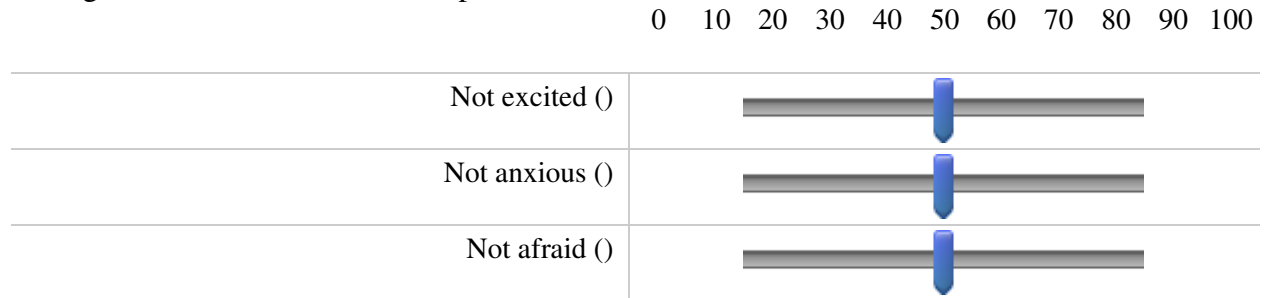
City Task Questionnaire

imm_1 How focused were you on this task?

- Not at all focused (1)
 - Somewhat focused (2)
 - Focused about half the time (3)
 - Mostly focused (4)
 - Very focused (5)
-

emot_1 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.



arous_1 Did you feel a heightened sense of arousal during the task?

- No (1)
 - Yes (2)
-

phys1_1 Did you experience any physical signs of arousal during the task? (e.g. sweating, increased heart rate, tight muscles, etc.)

- No (1)
 - Yes (2)
-

phys2_1 What physical signs of arousal did you experience?

ser_1 How seriously did you take this task?

- Not at all seriously (1)
 - Somewhat seriously (2)
 - Seriously about half the time (3)
 - Mostly seriously (5)
 - Very seriously (6)
-

avoid1_1 Did you purposely avoid going near the edge of the building?

- No (1)
 - Yes (2)
-

avoid2_1 Why did you avoid going near the edge of the building?

goal_1 What was your goal during the task?

PARTICIPANTS COMPLETED PATH TASK AT THIS TIME

Path Task Questionnaire

behav_2 How similar was your behavior in this task compared to how you would have behaved in this situation in real life?

- Not at all similar (1)
 - Somewhat similar (3)
 - Neither similar or dissimilar (4)
 - Mostly similar (5)
 - Very similar (6)
-




imm_2 How focused were you on this task?

- Not at all focused (1)
 - Somewhat focused (2)
 - Focused about half the time (3)
 - Mostly focused (4)
 - Very focused (5)
-

emot_2 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.

0 10 20 30 40 50 60 70 80 90 100

Not excited ()	
Not anxious ()	
Not afraid ()	

arous_2 Did you feel a heightened sense of arousal during the task?

- No (1)
- Yes (2)

phys1_2 Did you experience any physical signs of arousal during the task? (e.g. sweating, increased heart rate, tight muscles, etc.)

- No (1)
- Yes (2)

phys2_2 What physical signs of arousal did you experience?

ser_2 How seriously did you take this task?

- Not at all seriously (1)
 - Somewhat seriously (2)
 - Seriously about half the time (3)
 - Mostly seriously (5)
 - Very seriously (6)
-

avoid1_2 Did you purposely avoid going into the forest?

- No (1)
 - Yes (2)
-

avoid2_2 Why did you avoid going into the forest?

goal_2 What was your goal during the task?

You have completed this part of the study. For the next part, you will be playing the game Grand Theft Auto 5 for 5 minutes. Please look at the ID of the computer you are on, which will be behind the computer in your cubicle and be numbered 1-6 (It should also be on the computer itself under the keyboard). Your situation when playing the game will be based on your computer ID.

If you are using computer 1 or 4:

You are being chased by police, they are going to continually follow you and try to shoot or arrest you. You cannot get away from them. Try to survive in whatever way makes the most

sense to you for 5 minutes. Even if you die, when you come back at a hospital you will STILL be being chased, so keep going until 5 minutes is up.

If you are using computer 2 or 5:

You are at a shipping dock, there is a forklift near you as well as several boxes on pallets next to the buildings near you. Move as many of the boxes to be next to the shipping containers on the other side of the street as you can in 5 minutes.

If you are using computer 3 or 6:

You have no special instructions. Simply play the game for 5 minutes in whatever way you would like.

There is a list of controls behind the computer, take a look at them now until you are comfortable you will be able to play the game, then let the research assistant know when you are ready to continue.

PARTICIPANTS COMPLETED GTA TASK AT THIS TIME

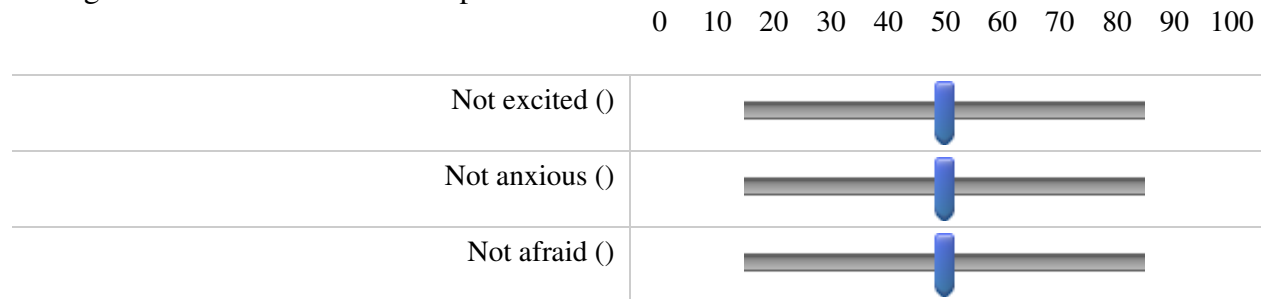
GTA Questionnaire

behav_3 How similar was your behavior in this task compared to how you would have behaved in this situation in real life?

- Not at all similar (1)
 - Somewhat similar (3)
 - Neither similar or dissimilar (4)
 - Mostly similar (5)
 - Very similar (6)
-

emot_3 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.



arous_3 Did you feel a heightened sense of arousal during the task?

- No (1)
 - Yes (2)
-

arous_3_2 What physical signs of arousal did you experience?

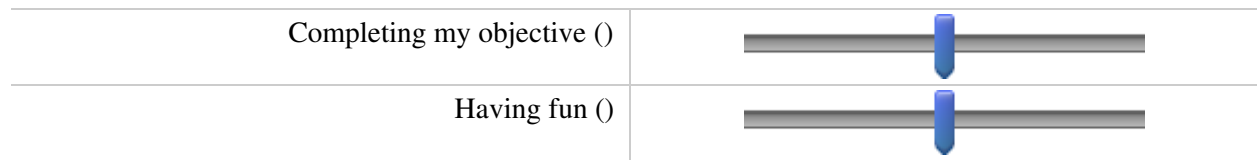
goal_3 What was your goal during the task?

ser_3 How seriously did you focus on the objective you were provided for the task (Running from the police, moving boxes)?

- Not at all seriously (1)
- Somewhat seriously (2)
- Seriously about half of the time (3)
- Mostly seriously (4)
- Very seriously (5)
- I did not have a specific objective (6)

focus_3 To what amount were you focused on the following when doing this task?

0 10 20 30 40 50 60 70 80 90 100



Overall Task Questionnaire

real1 Which game felt the most realistic to you?

real2 Why did this game feel the most realistic?

error Was there anything about this study that you would have changed?

APPENDIX B – STUDY 2 QUESTIONNAIRE

Q219 Participant ID

Q221 What is your date of birth? (mm/dd/yyyy)

(Used to calculate age at the time survey was completed for age comparison purposes)

Q223

How do you define your Race?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose all that apply}

- American Indian or Alaska Native (1)
 - Asian (2)
 - Black or African American (3)
 - Native Hawaiian or Other Pacific Islander (4)
 - White (5)
 - Another (6) _____
 - Do not wish to respond (7)
-

Q225

How do you define your Ethnicity?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose one}

- Hispanic or Latinx (1)
 - Not Hispanic or Latinx (2)
 - Another (3) _____
 - Do not wish to respond (4)
-

Q227

How do you define your Sexual Orientation/Preference?

(We are attempting to better understand relations between sexual orientation/preference and behavior)

Write in:

Q229 Do you identify as part of the LGBTQ+ Community?

- Yes (1)
- No (2)
- Do not wish to respond (4)

Q231

Choose a number that best describes your Sexual Orientation/Preference:

(We are attempting to better understand relations between sexual orientation/preference and behavior)

- Exclusively Homosexual 1 (1)
 - 2 (2)
 - 3 (3)
 - Bisexual 4 (4)
 - 5 (5)
 - 6 (6)
 - Exclusively Heterosexual 7 (7)
 - Asexual (8)
 - Pansexual (10)
 - Do not wish to respond (12)
-

Q243 How do you define your Gender Identity?

Note that Cisgender terms Cis Man and Cis Woman denote individuals whose sense of gender identity corresponds with the sex assigned to them at birth.

(We are attempting to better understand relations between gender identity and behavior)

{Choose all that apply}

- Agender (1)
- Androgynous (2)
- Cis Man (3)
- Cis Woman (4)
- Demiboy (30)
- Demigirl (31)
- Gender Fluid (5)
- Gender Non-Binary (8)
- Gender Non-Conforming (10)
- Gender Fluid (11)
- Gender Non-Binary (15)
- Gender Non-Conforming (16)
- Genderless (29)
- Genderqueer (17)
- Man (18)
- Third Gender (19)
- Trans Man (20)

- Trans Woman (21)
 - Transgender (22)
 - Transperson (23)
 - Two Spirit (24)
 - Woman (25)
 - Other (26) _____
 - Choose not to respond (27)
-

Q245 What was the sex assigned to you at birth?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose One}

- Male (1)
- Female (2)
- Intersex (5)
- Another (3) _____
- Do not wish to respond (4)

Mental Health 1 Have you ever been diagnosed with and/or treated by a professional for any of the following conditions? Please check all that apply:

- Depression (1)
 - Anxiety (2)
 - Bipolar Disorder (3)
 - Post-Traumatic Stress Disorder (PTSD) (4)
 - Obsessive Compulsive Disorder (OCD) (5)
 - Attention Deficit and Hyperactivity Disorder (ADHD) (6)
 - Schizophrenia and/or any other Psychosis Spectrum Disorder (7)
 - Borderline Personality Disorder (8)
 - Antisocial Personality Disorder (9)
 - Other Personality Disorder (10)
-
- Substance Misuse and/or Addiction (Alcohol and/or Drugs) (11)
 - Other Addiction (e.g., internet, gaming, sexual, gambling) (12)
-
- Anorexia, Bulimia, and/or any other Eating Disorder (13)
 - Insomnia and/or any other Sleep Disorder (14)
 - Other Mental Health Condition (15)
-
- Learning Disability (16)

None of the Above (17)

Mental Health 2 Which of the following conditions are you *currently* diagnosed with and/or receiving treatment by a professional for? Please check all that apply:

- Depression (1)
 - Anxiety (2)
 - Bipolar Disorder (3)
 - Post-Traumatic Stress Disorder (PTSD) (4)
 - Obsessive Compulsive Disorder (OCD) (5)
 - Attention Deficit and Hyperactivity Disorder (ADHD) (6)
 - Schizophrenia and/or any other Psychosis Spectrum Disorder (7)
 - Borderline Personality Disorder (8)
 - Antisocial Personality Disorder (9)
 - Other Personality Disorder (10)
-
- Substance Misuse and/or Addiction (Alcohol and/or Drugs) (11)
 - Other Addiction (e.g., internet, gaming, sexual, gambling) (12)
-
- Anorexia, Bulimia, and/or any other Eating Disorder (13)
 - Insomnia and/or any other Sleep Disorder (14)
 - Other Mental Health Condition (15)
-
- Learning Disability (16)

None of the Above (17)

SSPT

The following scale consists of a series of statements regarding preference for engaging in new or exciting tasks. For each of the following items, you will be asked to indicate how much you agree or disagree with the statement. There are no right or wrong answers and we ask that you respond honestly.

SSPT1 I enjoy participating in unsafe activities.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT2 I don't enjoy trying new things.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT3 I think it is important to try as many new things as I can.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT4 I do things even if I know that doing them will get me in trouble.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT5 I love challenging myself with new and interesting tasks.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT6 I think that excitement is more important than safety.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT7 I have the most fun when I am doing risky or dangerous things.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT8 I rarely do things that seem risky.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT9 I like to experience anything and everything I can.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT10 I like to explore new areas.

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

TIPI

Here are a number of personality traits that may or may not apply to you. Please indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

	Disagree strongly (1)	Disagree moderately (2)	Disagree a little (3)	Neither agree nor disagree (4)	Agree a little (5)	Agree moderately (6)	Agree strongly (7)
Extraverted, enthusiastic (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critical, quarrelsome (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dependable, self- disciplined (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious, easily upset (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open to new experiences, complex (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reserved, quiet (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sympathetic, warm (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disorganized, careless (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calm, emotionally stable (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conventional, uncreative (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SUPPS-P

Q119 Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. Be sure to indicate your agreement or disagreement for every statement below.

Q1 I finish what I start.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q2 I generally like to see things through to the end.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q3 I like to stop and think things over before I do them.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q4 I tend to act without thinking when I am really excited.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q5 I tend to lose control when I am in a great mood.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q6 I tend to value and follow a rational, "sensible" approach to things.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q7 I usually think carefully before doing anything.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q8 My thinking is usually careful and purposeful.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q9 I quite enjoy taking risks.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q10 Once I get going on something I hate to stop.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q11 Others are shocked or worried about the things I do when I am feeling very excited.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q12 Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q13 Unfinished tasks really bother me.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q14 I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q15 When I feel rejected, I will often say things that I later regret.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q16 I would like to learn to fly an airplane.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q17 When I am in great mood, I tend to get into situations that could cause me problems.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q18 I would enjoy the sensation of skiing very fast down a high mountain slope.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q19 When I am upset I often act without thinking.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q20 When I feel bad, I will often do things I later regret in order to make myself feel better now.

- Agree Strongly (1)
- Agree Some (2)
- Disagree Some (3)
- Disagree Strongly (4)

CUDIT-R

Q276 Have you used any cannabis over the past six months?

- No (1)
 - Yes (2)
-

Q277 How often do you use cannabis?

- Never (1)
 - Monthly or less (2)
 - 2-4 times per month (3)
 - 2-3 times per week (4)
 - 4+ times per week (5)
-

Q279 Please answer the following questions about your cannabis use. click the response that is most correct for you in relation to your cannabis use over the past six months.

	Never (1)	Less than Monthly (2)	Monthly (3)	Weekly (4)	Daily/almost daily (5)
How often during the past 6 months did you find that you were not able to stop using cannabis once you had started? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often in the past 6 months have you had a problem with your memory or concentration after using cannabis? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children? (5)

Q280 have you ever thought about cutting down, or stopping, your use of cannabis?

- Never (1)
- Yes, but not in the last 6 months (2)
- Yes, during the last 6 months (3)

Alcohol and Cannabis Norms

Q1 With respect to alcohol consumption, 1 standard drink is equivalent to 12 oz beer OR 8-9 oz of malt liquor/high alcohol beer OR 5oz of wine OR 1.5 oz shot of liquor straight or in a mixed drink. Please review the image carefully as it will help you understand what exactly counts as a standard drink of alcohol.

Q2 How many standard drinks did **you** consume each day during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Number of Standard Drinks (1)							

Q3 How many standard drinks do **you** think is acceptable to consume on each day during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Number of Standard Drinks (1)							

Q4 On which days did **you** consume marijuana during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you used marijuana, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5 On which days do **you** think it is acceptable to use marijuana in TYPICAL week?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you think it is acceptable, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6 On which days did **you** consume both alcohol and marijuana during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you used both, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q7 On which days do **you** think it is acceptable to consume both alcohol and marijuana in TYPICAL week?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you think it is acceptable to use both, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RBI Sexual Behavior

Q1 What is your sexual orientation?

Q2 Choose a number that best describes your sexual orientation/preferences:
(Enter "0" if you do not wish to answer or if you cannot describe your orientation/preference using this scale)

Exclusively Homosexual (1) - - Mostly Homosexual - - Bisexual (4) - - Mostly Heterosexual - - Exclusively Heterosexual (7)

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 0 (8)

Page Break

Q3 Have you ever performed oral sex on anyone?

No (1)

Yes (2)

Q4 How old were you the first time you performed oral sex on someone?

Q5 How many times in the last 30 days have you performed oral sex on someone?

Q6 How many different people have you performed oral sex on in the last 30 days?

Q7 How many times in the last 12 months have you performed oral sex on someone?

Q8 How many different people have you performed oral sex on in the last 12 months?

Q9 How many times in your life have you performed oral sex on someone?

Q10 How many different people have you performed oral sex on in your life?

Q11 Of the times that you have performed oral sex on someone, approximately how many times did you use protection? (i.e. barrier protection, such as condoms or dental dams. Not hormonal contraception)

- Never (1)
- Less than half of the times (2)
- Half of the times (3)
- More than half of the times (4)
- All of the times (5)

Q12 Have you ever had oral sex performed on you?

- No (1)
- Yes (2)

Q13 How old were you the first time oral sex was performed on you?

Q14 How many times in the last 30 days was oral sex performed on you?

Q15 How many different people have performed oral sex on you in the last 30 days?

Q16 How many times in the last 12 months was oral sex performed on you?

Q17 How many different people have performed oral sex on you in the last 12 months?

Q18 How many times in your life has oral sex been performed on you?

Q19 How many different people have performed oral sex on you in your life?

Q20 Of the times that you've had oral sex performed on you, approximately how many times did you use protection? (i.e. barrier protection, such as condoms or dental dams. Not hormonal

contraception, such as birth control pills or IUD)

- Never (1)
 - Less than half of the times (2)
 - Half of the times (3)
 - More than half of the times (4)
 - All of the times (5)
-

Q21 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q22 Have you ever had vaginal intercourse?

No (1)

Yes (2)

Q23 How old were you the first time you had vaginal intercourse?

Q24 How many times in the last 30 days have you had vaginal intercourse?

Q25 How many different people have you had vaginal intercourse with in the last 30 days?

Q26 How many times in the last 12 months have you had vaginal intercourse?

Q27 How many different people have you had vaginal intercourse with in the last 12 months?

Q28 How many times in your life have you had vaginal intercourse?

Q29 How many different people have you had vaginal intercourse with in your life?

Q30 Have you ever had UNPROTECTED vaginal intercourse?

No (1)

Yes (2)

Q31 How old were you the first time you had UNPROTECTED vaginal intercourse?

Q32 How many times in the last 30 days have you had UNPROTECTED vaginal intercourse?

Q33 How many different people have you had UNPROTECTED vaginal intercourse with in the last 30 days?

Q34 How many times in the last 12 months have you had UNPROTECTED vaginal intercourse?

Q35 How many different people have you had UNPROTECTED vaginal intercourse with in the last 12 months?

Q36 How many times in your life have you had UNPROTECTED vaginal intercourse?

Q37 How many different people have you had UNPROTECTED vaginal intercourse with in your life?

Q38 How many of these people were you in a serious, committed, monogamous relationship with at the time you were having UNPROTECTED vaginal intercourse with them?

Q39 Of these, how many did you have UNPROTECTED vaginal intercourse with when you first met, before you were in a relationship with them?

Q40 Have you ever had UNDER PROTECTED vaginal intercourse?

No (1)

Yes (2)

Q41 How old were you the first time you had UNDER PROTECTED vaginal intercourse?

Q42 How many times in the last 30 days have you had UNDER PROTECTED vaginal intercourse?

Q43 How many different people have you had UNDER PROTECTED vaginal intercourse with in the last 30 days?

Q44 How many times in the last 12 months have you had UNDER PROTECTED vaginal intercourse?

Q45 How many different people have you had UNDER PROTECTED vaginal intercourse with in the last 12 months?

Q46 How many times in your life have you had UNDER PROTECTED vaginal intercourse?

Q47 How many different people have you had UNDER PROTECTED vaginal intercourse with in your life?

Q48 How many of these people were you in a serious, committed, monogamous relationship with at the time you were having UNDER PROTECTED vaginal intercourse with them?

Q49 Of these, how many did you have UNDER PROTECTED vaginal intercourse with when you first met, before you were in a relationship with them?

Q50 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from

sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q51 Have you ever had anal intercourse?

No (1)

Yes (2)

Q52 How old were you the first time you had anal intercourse?

Q53 How many times in the last 30 days have you had anal intercourse?

Q54 How many different people have you had anal intercourse with in the last 30 days?

Q55 How many times in the last 12 months have you had anal intercourse?

Q56 How many different people have you had anal intercourse with in the last 12 months?

Q57 How many times in your life have you had anal intercourse?

Q58 How many different people have you had anal intercourse with in your life?

Q59 Have you ever had UNPROTECTED anal intercourse?

No (1)

Yes (2)

Q60 How old were you the first time you had UNPROTECTED anal intercourse?

Q61 How many times in the last 30 days have you had UNPROTECTED anal intercourse?

Q62 How many different people have you had UNPROTECTED anal intercourse with in the last 30 days?

Q63 How many times in the last 12 months have you had UNPROTECTED anal intercourse?

Q64 How many different people have you had UNPROTECTED anal intercourse with in the last 12 months?

Q65 How many times in your life have you had UNPROTECTED anal intercourse?

Q66 How many different people have you had UNPROTECTED anal intercourse with in your life?

Q67 How many of these people were you in a serious, committed, monogamous relationship with at the time you were having UNPROTECTED anal intercourse with them?

Q68 Of these, how many did you have UNPROTECTED anal intercourse with when you first met, before you were in a relationship with them?

Q69 Have you ever engaged in any other intimate or sexual acts with a person of a different sex than you?

If so, please list what. (ex. kissing, body contact, mutual masturbation, etc.)

No (1)

Yes (2) _____

Q70 Have you ever had sexual intercourse with more than one person at the same time?

No (1)

Yes (2)

Q71 How old were you the first time you had sexual intercourse with more than one person at the same time?

Q72 How many times in the last 30 days have you had sexual intercourse with more than one person at the same time?

Q73 How many different people have you had sexual intercourse with more than one person at the same time within the last 30 days?

Q74 How many times in the last 12 months have you had sexual intercourse with more than one person at the same time?

Q75 How many different people have you had sexual intercourse with more than one person at the same time within the last 12 months?

Q76 How many times in your life have you had sexual intercourse with more than one person at the same time?

Q77 How many different people have you had sexual intercourse with more than one person at the same time within your life?

Q78 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q79 Have you ever had a sexual encounter (oral, vaginal and/or anal sex) with a member of the same sex as you?

No (1)

Yes (2)

Q80 How old were you the first time you had a sexual encounter with someone of the same sex as you?

Q81 How many times in the last 30 days have you had a sexual encounter with someone of the same sex as you?

Q82 How many different people of the same sex have you had a sexual encounter with in the last 30 days?

Q83 How many times in the last 12 months have you had a sexual encounter with someone of the same sex as you?

Q84 How many different people of the same sex have you had a sexual encounter with in the last 12 months?

Q85 How many times in your life have you had a sexual encounter with someone of the same sex as you?

Q86 How many different people of the same sex have you had a sexual encounter with in your life?

Q87 Have you ever had an UNPROTECTED sexual encounter with a member of the same sex as you?

No (1)

Yes (2)

Q88 How many different same sex partners have you had an UNPROTECTED sexual encounter with in your life?

Q89 How many of these same sex partners were you in a serious, committed, monogamous relationship with at the time you were having an UNPROTECTED sexual encounter with them?

Q90 Of these, how many did you have an UNPROTECTED sexual encounter with when you first met, before you were in a relationship with them?

Q91 Have you ever engaged in any other intimate or sexual acts with a person of the same sex as you?

If so, please list what. (ex. kissing, body contact, mutual masturbation, etc.)

No (1)

Yes (2) _____

Q92 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q93 Have you ever had a one-night stand--a single sexual encounter (oral, vaginal, and/or anal sex) without an immediate plan for forming a long-term sexual or romantic relationship with the other individual?

No (1)

Yes (2)

Q94 How old were you the first time you had a one-night stand?

Q95 How many times in the last 30 days have you had a one-night stand?

Q96 How many different people have you had a one-night stand with in the last 30 days?

Q97 How many times in the last 12 months have you had a one-night stand?

Q98 How many different people have you had a one-night stand with in the last 12 months?

Q99 How many times in your life have you had a one-night stand?

Q100 How many different people in your life have you had a one-night stand with?

Q101 Of all the people you have had a one-night stand with, how many did you know before the encounter?

Q102 Have you ever had an UNPROTECTED sexual encounter during a one-night stand?

No (1)

Yes (2)

Q103 How many different people have you had an UNPROTECTED sexual encounter as part of a one-night stand with in your life?

Q104 Have you ever had UNDER PROTECTED vaginal intercourse during a one-night stand?

No (1)

Yes (2)

Q105 How many different people have you had UNDER PROTECTED vaginal intercourse as part of a one-night stand with in your life?

Q106 Have you ever engaged in any other intimate or sexual acts with as part of a one-night stand?

If so, please list what. (ex. kissing, body contact, mutual masturbation, etc.)

No (1)

Yes (2) _____

Q107 While in a committed relationship, have you ever had a sexual encounter (oral, vaginal and/or anal sex) with a person who was not your partner?

No (1)

Yes (2)

Q108 How many times in your life have you been in a committed relationship and had a sexual encounter with someone who was not your partner?

Q109 Of these encounters, how many times were UNPROTECTED sexual encounters?

Q110 Of these encounters, how many times were UNDER PROTECTED vaginal sex?

Q111 Have you ever had a sexual encounter (oral, vaginal, and/or anal sex) in a public place?

No (1)

Yes (2)

Q112 How old were you the first time you had a sexual encounter in a public place?

Q113 How many times in the last 30 days have you had a sexual encounter in a public place?

Q114 How many different people have you had a sexual encounter with in a public place with in the last 30 days?

Q115 How many times in the last 12 months have you had a sexual encounter in a public place?

Q116 How many different people have you had a sexual encounter with in a public place with in the last 12 months?

Q117 How many times in your life have you had a sexual encounter in a public place?

Q118 How many different people have you had sex in a public place with in your life?

Q119 How often do you use condoms when having vaginal or anal intercourse with a serious partner (i.e., a long term partner or someone you are in a relationship with)?

- Never (1)
- Almost Never (2)
- Sometimes (3)
- Almost Always (4)
- Always (5)
- I Have Never Had a Serious Partner (6)

Q120 How often do you use condoms when having vaginal or anal intercourse with casual partners (i.e., in a one-night stand, or a person you are having sex with outside of a romantic relationship)?

- Never (1)
 - Almost Never (2)
 - Sometimes (3)
 - Almost Always (4)
 - Always (5)
 - Not Applicable to Me (6)
-

Q121 How often do you use other forms of contraception besides condoms (i.e., birth control pills/patch/shot/ring, IUDs, spermicidal foam, etc.) when having vaginal intercourse?

- Never (1)
 - Almost Never (2)
 - Sometimes (3)
 - Almost Always (4)
 - Always (5)
 - Not Applicable to Me (6)
-

Q122 Have you ever gotten tested for sexually transmitted diseases or infections?

- No (1)
 - Yes (2)
-

Q123 How often do you get tested?

- Once per month or more (1)
 - 3-4 times per year (3)
 - Twice per year (2)
 - Once per year (4)
 - Less than once per year (5)
-

Q124 Have you ever tested positive for a sexually transmitted disease or infection?

- No (1)
 - Yes (2)
-

Q125 What did you test positive for? (Please check all that apply)

- Bacterial Vaginosis (BV) (1)
 - Chlamydia (2)
 - Hepatitis, Viral (3)
 - Herpes, Genital (4)
 - HIV/AIDS (5)
 - Human Papillomavirus (HPV) (6)
 - Pelvic Inflammatory Disease (PID) (7)
 - Syphilis (8)
 - Trichomoniasis (9)
 - Other (10)
-

Q126 Have you ever taken naked pictures of yourself?

- No (1)
 - Yes (2)
-

Q127 Did you send these naked pictures to anyone?

- No (1)
 - Yes (2)
-

Q128 Was that person a stranger (someone you did not know)?

No (1)

Yes (2)

Q129 Have you ever made a video of yourself while having a sexual encounter (oral, vaginal, and/or anal sex)?

No (1)

Yes (2)

Q130 Did you send this video to anyone?

No (1)

Yes (2)

Q131 Was that person a stranger (someone you did not know)?

No (1)

Yes (2)

Q132 Have you ever posed for or taken nude or semi-nude photos, videos, or webcams (including sexual encounters) knowing that they would be posted online?

No (1)

Yes (2)

Q133 Have you ever taken nude or semi-nude photos, videos, or webcams (including sexual encounters) of your sexual partner?

No (1)

Yes (2)

Q134 Did your partner consent to this activity?

No (1)

Yes (2)

Q135 Did you ever post these online?

No (1)

Yes (2)

Q136 Did you ever post these online without your partner's permission?

No (1)

Yes (2)

Q137 Have you ever taken part in uncommon sexual acts/fetishes (e.g., bestiality, bondage, furryism, sadism and masochism/S&M, autoerotic asphyxiation/choking, etc.)?

No (1)

Yes (2)

Q138 What is/are the uncommon sexual acts/fetishes that you have engaged in?

Q139 Do you take part in these acts for the excitement/rush/dangerousness of the experience?

- Not at all (1)
- Somewhat (2)
- Mostly (3)
- Completely (4)

Q140 Do you ask your partners if they have been recently tested for sexual transmitted diseases or infections before having sex?

- No (1)
 - Yes (2)
-

Q141 What reason have you had for not asking your partner(s) if they have been recently tested for sexual transmitted diseases or infections? (Please check all that apply).

- Not concerned based upon knowledge of previous sexual history (1)
- Not concerned based upon physical appearance (2)
- Did not want to upset/offend your partner (3)
- Were too preoccupied-occupied sexually/emotionally (4)
- Did not want to ruin the mood (5)
- Felt that the associated risks were very low (6)
- Enjoyed the excitement of the experience (7)
- Forgot to ask (8)
- Other (9)

RBI – Substance Use

Q1 The following items assess substance use behaviors. Please answer all of the items honestly and as accurately as possible. Remember, NONE of this information could be used to identify you or be linked to you.

Q2 For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 6 months: If you do it daily, please enter 183, twice a day would be 365, three times a day would be 548, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime: If daily for one year please enter 365, if daily for multiple years please enter 365 multiplied by the number of years. If more than once per day, please enter times per day multiplied by 365, then multiplied by number of years. Please use your best estimate.

Q3 Have you ever smoked a cigarette?

No (1)

Yes (2)

Q4 How old were you the first time you smoked a cigarette?

Q5 On a typical day, how many cigarettes do you smoke? (Enter a number, e.g. 5., if every other day, enter .5)

Q6 Do you currently consider yourself:

- A non-smoker (currently do not smoke any cigarettes at all) (1)
 - A smoker who is currently quitting (2)
 - A social smoker (only smokes when with other people) (3)
 - A casual smoker (not daily use, not limited to social use) (4)
 - A smoker (daily use) (6)
-

Q7 Think about the time in your life when you smoked the most. How would you consider yourself?

- A non-smoker (currently do not smoke any cigarettes at all) (1)
 - A social smoker (only smokes when with other people) (3)
 - A casual smoker (not daily use, not limited to social use) (4)
 - A smoker (daily use) (6)
-

Q8 Have you ever used tobacco not in cigarette form (i.e., chewing tobacco, pipe tobacco, cigars, cigarillos, hookah)?

- No (1)
 - Yes (2)
-

Q9 How old were you the first time you used tobacco not in cigarette form (i.e., chewing tobacco)?

Q10 On a typical day, how times do you use tobacco in a non-cigarette form? (Enter a number, e.g. 5., if every other day, enter .5)

Q11 Do you currently consider yourself:

- A non-user (currently do not use any tobacco at all) (1)
- A user who is currently quitting (2)
- A social user (only uses when with other people) (3)
- A casual use (not daily use, not limited to social use) (4)
- A user (daily use) (6)

Q12 Think about the time in your life when you smoked the most. How would you consider yourself?

- A non-user (currently do not use any tobacco at all) (1)
- A user who is currently quitting (2)
- A social user (only uses when with other people) (3)
- A casual use (not daily use, not limited to social use) (4)
- A user (daily use) (6)

Q13 Have you ever used an electronic cigarette (i.e. e-cig)?

No (1)

Yes (2)

Q14 How old were you the first time you used an electronic cigarette?

Q15 On a typical day, how many times per day do you use your electronic cigarette?

Q16 When using your electronic cigarette, how many "puffs"/"drags" do you typically take?

Q17 How many milligrams (mg) of nicotine are in the electronic cigarettes you typically use?

- 0 mg (nicotine free) (1)
 - approximately 6 mg (2)
 - approximately 12 mg (3)
 - approximately 18 mg (4)
 - approximately 24 mg (5)
 - more than 24 mg (6)
 - I'm not sure (7)
-

Q18 Have you ever used marijuana (smoked or other method)?

- No (1)
 - Yes (2)
-

Q19 For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 6 months: If you do it daily, please enter 183, twice a day would be 365, three times a day would be 548, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime: If daily for one year please enter 365, if daily for multiple years please enter 365 multiplied by the number of years. If more than once per day, please enter times per day multiplied by 365, then multiplied by number of years. Please use your best estimate.

Q20 How old were you the first time you used marijuana?

Q21 How many times have you used marijuana in the last 30 days?

Q22 How many times have you used marijuana in the last 6 months?

Q23 How many times have you used marijuana in the last year?

Q24 How many times in your life have you used marijuana?

Q25 For an average week, on how many weekdays do you use marijuana?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q26 For an average week, how many times do you use marijuana?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q27 Have you ever used ecstasy? (i.e. MDMA, X, MDA, Molly, rolls, etc.)

No (1)

Yes (2)

Q28 How old were you the first time you used ecstasy?

Q29 How many times have you used ecstasy in the last 30 days?

Q30 How many times have you used ecstasy in the last 6 months?

Q31 How many times have you used ecstasy in the last year?

Q32 How many times in your life have you used ecstasy?

Q33 For an average week, on how many weekdays do you use ecstasy?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q34 For an average week, how many times do you use ecstasy?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q35 Have you ever used Ketamine/Special K?

No (1)

Yes (2)

Q36 How old were you the first time you used Ketamine/Special K?

Q37 How many times have you used Ketamine/Special K in the last 30 days?

Q38 How many times have you used Ketamine/Special K in the last 6 months?

Q39 How many times have you used Ketamine/Special K in the last year?

Q40 How many times in your life have you used Ketamine/Special K?

Q41 For an average week, on how many weekdays do you use Ketamine/Special K?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q42 For an average week, how many times do you use Ketamine/Special K?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q43 Have you ever used heroin?

No (1)

Yes (2)

Q44 How old were you the first time you used heroin?

Q45 How many times have you used heroin in the last 30 days?

Q46 How many times have you used heroin in the 6 months?

Q47 How many times have you used heroin in the last year?

Q48 How many times in your life have you used heroin?

Q49 How have you used heroin? (check all that apply)

- Smoked (1)
 - Snorted (2)
 - Injected into your veins (3)
 - Injected not into your veins (4)
 - Other (5) _____
-

Q50 For an average week, on how many weekdays do you use heroin?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q51 For an average week, how many times do you use heroin?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q52 Have you ever used pills/prescription drugs not for medical reasons, but to get high?

- No (1)
 - Yes (2)
-

Q53 For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 6 months: If you do it daily, please enter 183, twice a day would be 365, three times a day would be 548, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime: If daily for one year please enter 365, if daily for multiple years please enter 365 multiplied by the number of years. If more than once per day, please enter times per day multiplied by 365, then multiplied by number of years. Please use your best estimate.

Q54 How old were you the first time you used pills/prescription drugs not for medical reasons, but to get high?

Q55 How many times have you used pills/prescription drugs not for medical reasons, but to get high in the last 30 days?

Q56 How many times have you used pills/prescription drugs not for medical reasons, but to get high in the last 6 months?

Q57 How many times have you used pills/prescription drugs not for medical reasons, but to get high in the last year?

Q58 How many times in your life have you used pills/prescription drugs not for medical reasons, but to get high?

Q59 For an average week, on how many weekdays do you use pills/prescription drugs not for medical reasons, but to get high?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q60 For an average week, how many times do you use pills/prescription drugs not for medical reasons, but to get high?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q61 What pills/prescription drugs have you taken to get high? (check all that apply)

Opioids / pain killers (e.g. codeine, morphine, hydrocodone/Vicodin, oxycodone/Percocet, Oxycontin, darvon, demeral, dilaudid, lomofil, methadone, etc.) (1)

Stimulants / "uppers" (e.g. adderall, dexadrine, ritaline, Concerta, Vyvanse, methylenidate, etc.) (4)

Depressants / "downers" (e.g. barbiturates, benzodiazepines, muscle relaxers, tranquilizers, xanax, valium, phenobarbital, nembital, quaalude, roofies, etc.) (2)

Other (3) _____

Q62 Have you ever used cocaine? (do not include crack use in your answers)

No (1)

Yes (2)

Q63 How old were you the first time you used cocaine?

Q64 How many times have you used cocaine in the last 30 days?

Q65 How many times have you used cocaine in the last 6 months?

Q66 How many times have you used cocaine in the last year?

Q67 How many times in your life have you used cocaine?

Q68 For an average week, on how many weekdays do you use cocaine?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q69 For an average week, how many times do you use cocaine?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q70 How have you used cocaine? (check all that apply)

- Smoked (1)
 - Snorted (2)
 - Injected into your veins (3)
 - Injected not into your veins (4)
 - Other (5) _____
-

Q71 Have you ever smoked crack? (do not include cocaine use in your answers)

No (1)

Yes (2)

Q72 How old were you the first time you smoked crack?

Q73 How many times have you smoked crack in the last 30 days?

Q74 How many times have you smoked crack in the last 6 months?

Q75 How many times have you smoked crack in the last year?

Q76 How many times in your life have you smoked crack?

Q77 For an average week, on how many weekdays do you smoke crack?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q78 For an average week, how many times do you smoke crack?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q79 Have you ever inhaled (or huffed) anything in order to get high? (e.g. "whip-its" nitrous, poppers, freon, glue, gasoline, paint, nitrates, paint thinner, spray cans, etc.)

No (1)

Yes (2)

Q80 How old were you the first time you inhaled (or huffed) anything in order to get high?

Q81 How many times have you inhaled (or huffed) anything in order to get high in the last 30 days?

Q82 How many times have you inhaled (or huffed) anything in order to get high in the last 6 months?

Q83 How many times have you inhaled (or huffed) anything in order to get high in the last year?

Q84
get high?

How many times in your life have you inhaled (or huffed) anything in order to

Q85 For an average week, on how many weekdays do you inhale (or huff) anything in order to get high?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

Q86 For an average week, how many times do you inhale (or huff) anything in order to get high?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q87 Have you ever used hallucinogens (acid, LSD, "magic mushrooms", psilocybin, DMT, mescaline, peyote, 2CI, 2CB, etc.)?

- No (1)
 - Yes (2)
-

Q88 How old were you the first time you used hallucinogens?

Q89 How many times have you used hallucinogens in the last 30 days?

Q90 How many times have you used hallucinogens in the last 6 months?

Q91 How many times have you used hallucinogens in the last year?

Q92 How many times in your life have you used hallucinogens?

Q93 For an average week, how many times do you use hallucinogens?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q94 What hallucinogens have you used? (check all that apply)

- LSD / "acid" (1)
 - Psilocybin / "magic mushrooms" (2)
 - DMT (4)
 - Mescaline / Peyote (3)
 - Synthetic hallucinogens / research chemicals (e.g. 2CI, 2CB, 25i nbome, DOB, etc.) (5)
 - Other (6) _____
-

Q95 Have you ever used methamphetamine? (i.e. meth, crystal ice, crank, ice, etc.)

No (1)

Yes (2)

Q96 How old were you the first time you used methamphetamine?

Q97 How many times have you used methamphetamine in the last 30 days?

Q98 How many times have you used methamphetamine in the last 6 months?

Q99 How many times have you used methamphetamine in the last year?

Q100 How many times in your life have you used methamphetamine?

Q101 For an average week, on how many weekdays do you use methamphetamine?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

Q102 For an average week, how many times do you use methamphetamine?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

6 (7)

7 (8)

more than once a day (9)

Q103 How have you used methamphetamine? (check all that apply)

- Smoked (1)
 - Snorted (2)
 - Injected into your veins (3)
 - Injected not into your veins (4)
 - Other (5) _____
-

Q104 Have you ever used steroids for nonmedical reasons?

- No (1)
 - Yes (2)
-

Q105 How old were you the first time you used steroids?

Q106 How many times have you used steroids in the last 30 days?

Q107 How many times have you used steroids in the last 6 months?

Q108 How many times have you used steroids in the last year?

Q109 How many times in your life have you used steroids?

Q110 Have you ever used a substance not yet mentioned to get high?

No (1)

Yes (2)

Q111 What were the substance(s)?

Q112 How old were you the first time you used these substance(s)?

Q113 How many times have you used these substance(s) in the last 30 days?

Q114 How many times have you used these substance(s) in the last 6 months?

Q115 How many times have you used these substance(s) in the last year?

Q116 How many times in your life have you used these substance(s)?

Q117 For an average week, on how many weekdays do you use this substance?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

Q118 For an average week, how many times do you use this substance?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q119 Have you ever choked yourself or had others choke you (played the black-out, choking, or pass-out game) in order to get a rush or get high?

- No (1)
 - Yes (2)
-

Q120 How old were you the first time you choked yourself or had others choke you?

Q121 How many times have you choked yourself or had others choke you in the last 30 days?

Q122
last 6 months?

How many times have you choked yourself or had others choke you in the

Q123
last year?

How many times have you choked yourself or had others choke you in the

Q124
choke you?

How many times in your life have you choked yourself or had others

Q125 Have you ever used a combination of substances to get a better high?

No (1)

Yes (2)

Q126

How many times have you combined these drugs in the last 30 days?

Q127 How many times have you combined these drugs in the last 6 months?

Q128 How many times have you combined these drugs in the last year?

Q129 How many times in your life have you combined these drugs?

Q130 Have you ever used an unknown substance (i.e., someone just hands you something and you swallow, snort, smoke, or inject it without knowing what it is)?

No (1)

Yes (2)

Q131 How old were you the first time you used an unknown substance?

Q132 How many times have you used an unknown substance in the last 30 days?

Q133
months?

How many times have you used an unknown substance in the last 6

Q134

How many times have you used an unknown substance in the last year?

Q135

How many times in your life have you used an unknown substance?

Q136 Have you ever used alcohol or drugs to the point of being drunk or high when you were alone?

No (1)

Yes (2)

Q137 In the last 30 days, how many days were you alone when you used drugs or alcohol?

Q138 In the last 6 months, how many days were you alone when you used drugs or alcohol?

Q139 In the last year, how many days were you alone when you used drugs or alcohol?

Q140 On how many days in your lifetime were you alone when you used drugs or alcohol?

Q141 On how many of the last 30 days did you use any alcohol or drugs to the point of being drunk or high regardless of where you were or who you were with?

Q142 Have you ever gone to school or work while drunk or high?

No (1)

Yes (2)

Q143 How many times did you go to school or work while you were drunk or high in the last 30 days?

Q144 How many of these times were because you woke up drunk or high from the night before?

Q145 How many times in your life did you go to school or work while you were drunk or high?

Q146 How many of these times were because you woke up drunk or high from the night before?

Q147 Have you ever missed school, work, or social engagements because you were drunk or high?

No (1)

Yes (2)

Q148 Have you ever used alcohol or drugs while driving? (do not count medication taken for medical reasons)

No (1)

Yes (2)

Q149 Have you ever used alcohol or drugs while pregnant or nursing? (do not count medication taken for medical reasons)

No (1)

Yes (2)

Q150 Have you ever used alcohol or drugs while babysitting or providing childcare? (do not count medication taken for medical reasons)

No (1)

Yes (2)

Q151 Have you ever self-harmed (cut yourself, burned yourself, bit yourself, etc.) while drunk or high?

No (1)

Yes (2)

Q152 Have you ever let someone else harm you (cut you, burn you, bite you, etc.) on purpose while drunk or high?

No (1)

Yes (2)

Q153 Have you ever engaged in sexual behavior while drunk or high that you would not have engaged in if you were sober (unprotected sex, sex with a stranger, sex with a friend/co-worker/acquaintance, sex for the first time, sex with someone you know has an illness or

sexually transmitted disease, sex for money, paid for sex, forced sexual behavior on someone, etc.)? Do Not Include Sexual Encounters that were forced on you.

No (1)

Yes (2)

Q154 What was/were the sexual behavior(s)?

Q155 Why would you not engage in it/them if you were sober?

Q156 Did you engage in this/these for the excitement/rush/dangerousness of the experience?

Not at all (1)

Somewhat (2)

Mostly (3)

Completely (4)

Q157 What substances and/or combinations of substances were you using when you engaged in sexual behavior that you would not have done if you were sober?

Check all that apply:

- Alcohol only (1)
 - Marijuana only (2)
 - Other drugs only (3)
 - Alcohol and marijuana together (4)
 - Alcohol and other drugs together (5)
 - Marijuana and other drugs together (6)
 - Alcohol, marijuana, and other drugs together (7)
 - Other (8) _____
-

Q158 Approximately how many times in your lifetime have you engaged in sexual behavior while using alcohol that you would not have done if you were sober?

Enter a number:

Q159 Approximately how many times in your lifetime have you engaged in sexual behavior while using marijuana that you would not have done if you were sober?

Enter a number:

Q160 Approximately how many times in your lifetime have you engaged in sexual behavior while using substances other than marijuana or alcohol that you would not have done if you were

sober?

Enter a number:

Q161 Approximately how many times in your lifetime have you engaged in sexual behavior while using combinations of alcohol, marijuana, and/or other substances that you would not have done if you were sober?

Enter a number:

Q162 Have you ever used alcohol or drugs in the morning/when you first wake up (not including caffeine or tobacco) to get drunk or high?

No (1)

Yes (2)

Q163 How many days have you used alcohol or drugs in the morning/when you first wake up during the last 30 days?

Q164 How many of those were weekdays? (if daily enter 20)

Q165 How many days in your life have you used alcohol or drugs in the morning/when you first wake up?

Q166 How many of those were weekdays?

Q167 Have you ever gotten into a fight while drunk or high?

No (1)

Yes (2)

Q168 Have you ever overdosed from alcohol or drugs?

No (1)

Yes (2)

Q169 How many times have you overdosed?

Q170 What drugs have you overdosed on?

Q171 Did you ever have to go to the emergency room because of overdose?

No (1)

Yes (2)

Q172 Did you ever have your stomach pumped because of this overdose?

No (1)

Yes (2)

Q173 Have you ever been in treatment for alcohol or drug abuse or dependence/addiction?

No (1)

Yes (2)

Q174 How many times have you been in alcohol or drug treatment?

Q175 How old were you when you first started a treatment program?

Suicidal Behaviors Questions

Q1 Have you ever felt that life is hardly worth living?

- Yes, within the last year (1)
 - Yes, more than a year ago (2)
 - No, never (3)
-

Q2 Have you ever thought that you would be better off dead?

- Yes, within the last year (1)
 - Yes, more than a year ago (2)
 - No, never (3)
-

Q3 Have you ever seriously considered taking your own life?

- Yes, within the last year (1)
 - Yes, more than a year ago (2)
 - No, never (3)
-

Q4 Have you ever attempted to take your own life?

- Yes, within the last year (1)
- Yes, more than a year ago (2)
- No, never (3)

Exposure to Violence, Trauma, and Victimization – Adult LTVH

Q1 Have you ever been involved in a natural disaster, such as a tornado, hurricane, flood, or earthquake?

- Yes (1)
 - No (0)
-

Q2 How old were you the first time it happened?

Q3 Were you in danger of death or serious injury?

- Yes (1)
 - No (0)
-

Q4 Did you feel intense fear, helplessness, or horror?

- Yes (1)
 - No (0)
-

Q5 Was there another time you were involved in a natural disaster, such as a tornado, hurricane, flood, or earthquake?

- Yes (1)
- No (0)

Q6 Have you ever been involved in a man-made disaster, such as a fire, train crash, car accident, or building collapse?

Yes (1)

No (0)

Q7 How old were you the first time it happened?

Q8 Were you in danger of death or serious injury?

Yes (1)

No (0)

Q9 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (2)

Q10 Was there another time you were involved in a man-made disaster, such as a fire, train crash, car accident, or building collapse?

Yes (1)

No (0)

Q11 Have you ever been involved in a direct combat experience in a war (Includes police shootings and gang fights)

Yes (1)

No (0)

Q12 How old were you the first time it happened?

Q13 Were you in danger of death or serious injury?

Yes (1)

No (0)

Q14 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q15 Was there another time where you were involved in direct combat experience in a war?

Yes (1)

No (0)

Q16 Have you ever lived in a war zone? (For example, the Persian Gulf or Bosnia).

Yes (1)

No (0)

Q17 How old were you the first time it happened?

Q18 Were you in danger or death or serious injury?

Yes (1)

No (0)

Q19 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q20 Was there another time that you lived in a war zone?

Yes (1)

No (0)

Q21 Have you ever had a serious accident at work, at home, or somewhere else?

Yes (1)

No (0)

Q22 How old were you the first time it happened?

Q23 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q24 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q25 Was there another time you had a serious accident at work, at home, or somewhere else?

Yes (1)

No (0)

Q26 Have you ever been exposed to dangerous chemicals or radioactivity?

Yes (1)

No (0)

Q27 How old were you the first time it happened?

Q28 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q29 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q30 Was there another time that you were exposed to dangerous chemicals or radioactivity?

Yes (1)

No (0)

Q31 Have you ever been shot at, stabbed, struck, kicked, beaten, punched, slapped around, or otherwise physically harmed?

Yes (1)

No (0)

Q32 How old were you the first time this happened?

Q33 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q34 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q35 How many times did this person do this to you?

Q36 How old were you the last time this person did this to you?

Q37 Has anyone else ever shot at, stabbed, struck, kicked, beaten, punched, slapped around, or otherwise physically harmed you?

Yes (1)

No (0)

Q38 Have you ever been threatened with any kind of a weapon, like a knife, gun, baseball bat, frying pan, scissors, stick, rock, or bottle?

Yes (1)

No (0)

Q39 How old were you the first time it happened?

Q40 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q41 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q42 How many times did this person do this to you?

Q43 How old were you the last time this person did this to you?

Q44 Has anyone else threatened you with any kind of weapon?

Yes (1)

No (0)

Q45 Has anyone ever threatened you in a face-to-face confrontation?

Yes (1)

No (0)

Q46 How old were you the first time it happened?

Q47 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q48 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q49 How many times did this person do this to you?

Q50 How old were you the last time this person did this to you?

Q51 Has anyone else threatened you in a face-to-face confrontation?

Yes (1)

No (0)

Q52 Have you ever been actually assaulted with any kind of a weapon, like a knife, gun, baseball bat, frying pan, scissors, stick, rock, or bottle?

Yes (1)

No (0)

Q53 How old were you the first time it happened?

Q54 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q55 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q56 How many times did this person do this to you?

Q57 How old were you the last time this person did this to you?

Q58 Has anyone else actually assaulted you with any kind of a weapon, like a knife, gun, baseball bat, frying pan, scissors, stick, rock, or bottle?

Yes (1)

No (0)

Q59 When you were a child--that is, when you were in elementary or middle school, before about age 12--were you ever struck, kicked, beaten, punched, slapped around, or otherwise physically harmed?

Yes (1)

No (0)

Q60 How old were you the first time it happened?

Q61 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q62 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q63 How many times did this person do this to you?

Q64 How old were you the last time this person did this to you?

Q65 During your childhood were you struck, kicked, beaten, punched, slapped around, or otherwise physically harmed by anyone else?

Yes (1)

No (0)

Q66 When you were a child- that is, when you were in elementary or middle school, before about age 12-were you ever physically abused?

Yes (1)

No (0)

Q67 How old were you the first time it happened?

Q68 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q69 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q70 How many times did this person do this to you?

Q71 How old were you the last time this person did this to you?

Q72 During your childhood has anyone else physically abused you?

Yes (1)

No (0)

Q73 Has anyone--male or female--ever forced or coerced you to engage in unwanted sexual activity?

Yes (1)

No (0)

Q74 How old were you the first time it happened?

Q75 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q76 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q77 How many times did this person do this to you?

Q78 How old were you the last time this person did this to you?

Q79 Has anyone else--male or female--ever forced or coerced you to engage in unwanted sexual activity?

Yes (1)

No (0)

Q80 Other than what we just talked about, did anyone, male or female, ever attempt to--but not actually-- force you to engage in unwanted sexual activity?

Yes (1)

No (0)

Q81 How old were you the first time it happened?

Q82 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q83 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q84 How many times did this person do this to you?

Q85 How old were you the last time this person did this to you?

Q86 Has anyone else--male or female, attempted to--but not actually--forced you to engage in unwanted sexual activity?

Yes (1)

No (0)

Q87 Other than what we just talked about, has anyone ever actually touched private parts of your body or made you touch theirs against your wishes?

Yes (1)

No (0)

Q88 How old were you the first time it happened?

Q89 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q90 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q91 How many times did this person do this to you?

Q92 How old were you the last time this person did this to you?

Q93 Has anyone else ever actually touched private parts of your body or made you touch theirs against your wishes?

Yes (1)

No (0)

Q94 Have you ever had an immediate family member, romantic partner, or very close friend who was murdered?

Yes (1)

No (0)

Q95 How old were you the first time it happened?

Q96 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q97 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q98 Was anyone else who was an immediate family member, romantic partner, or very close friend murdered?

Yes (1)

No (0)

Q99 Have you ever seen or been present when someone was murdered or seriously injured?

Yes (1)

No (0)

Q100 How old were you the first time it happened?

Q101 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q102 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q103 Was there any other time when you saw or were present when someone was murdered or seriously injured?

Yes (1)

No (0)

Q104 Have you ever had an immediate family member, romantic partner, or very close friend commit suicide?

Yes (1)

No (0)

Q105 How old were you the first time it happened?

Q106 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q107 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q108 Did anyone else who was an immediate family member, romantic partner, or very close friend commit suicide?

Yes (1)

No (0)

Q109 Have you ever seen a dead or mutilated body? Other than at a funeral, in the movies or newspaper?

Yes (1)

No (0)

Q110 How old were you the first time it happened?

Q111 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q112 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q113 Was there any other time when you saw a dead or mutilated body?

Yes (1)

No (0)

Q114 Have you ever seen or been present when another person was shot at, stabbed, struck, kicked, beaten, slapped around, or otherwise physically harmed?

Yes (1)

No (0)

Q115 How old were you the first time it happened?

Q116 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q117 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q118 Was there any other time when you saw or were present when another person was shot at, stabbed, struck, kicked, beaten, slapped around, or otherwise physically harmed?

Yes (1)

No (0)

Q119 Have you ever seen or been present when another person was raped, sexually attacked, or made to engage in unwanted sexual activity?

Yes (1)

No (0)

Q120 How old were you the first time it happened?

Q121 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q122 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q123 Was there any other time when you saw or were present when another person was raped, sexually attacked, or made to engage in unwanted sexual activity?

Yes (1)

No (0)

Q124 Has anyone ever intentionally damaged or destroyed property owned by you or by someone in your household?

Yes (1)

No (0)

Q125 How old were you the first time it happened?

Q126 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q127 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q128 Has anyone else intentionally damaged or destroyed property owned by you or by someone in your household?

Yes (1)

No (0)

Q129 Has anyone ever stolen something from you by using force or the threat of force like in a stick-up, mugging, or car-jacking?

Yes (1)

No (0)

Q130 How old were you the first time it happened?

Q131 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q132 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q133 Has anyone else ever stolen something from you by using force or the threat of force like in a stick-up, mugging, or car-jacking?

Yes (1)

No (0)

Q134 Has anyone ever tried to--but not actually--steal something from you by using force or the threat of force like in a stick-up, mugging, or car-jacking?

- Yes (1)
 - No (0)
-

Q135 How old were you the first time it happened?

Q136 Were you in danger of death or serious physical injury?

- Yes (1)
 - No (0)
-

Q137 Did you feel intense fear, helplessness, or horror?

- Yes (1)
 - No (0)
-

Q138 Has anyone else ever tried to--but not actually--steal something from you by using force or the threat of force like in a stick-up, mugging, or car-jacking?

- Yes (1)
- No (0)

Q139 Has anyone ever tried to or actually broken in to your house, garage, shed, or storage room when you were not there?

Yes (1)

No (0)

Q140 How old were you the first time it happened?

Q141 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q142 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q143 Has anyone else ever tried to or actually broken in to your house, garage, shed, or storage room when you were not there?

Yes (1)

No (0)

Q144 Has anyone ever tried to or actually broken in to your house, garage, shed, or storage room when you were there?

Yes (1)

No (0)

Q145 How old were you the first time it happened?

Q146 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q147 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q148 Has anyone else ever tried to or actually broken in to your house, garage, shed, or storage room when you were there?

Yes (1)

No (0)

Q149 Has anyone ever stolen something directly from you without the threat or use of force (for example purse-snatching or pick-pocket)?

Yes (1)

No (0)

Q150 How old were you the first time it happened?

Q151 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q152 Has anyone else stolen something directly from you without the threat or use of force?

Yes (1)

No (0)

Q153 Have you ever been kidnapped or held captive?

Yes (1)

No (0)

Q154 How old were you the first time it happened?

Q155 How long were you held or not allowed to leave?

Q156 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q157 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q158 Was there any other time when you were kidnapped or held captive?

Yes (1)

No (0)

Q159 Have you ever been stalked by anyone? For example, has anyone ever followed or spied on you?

Yes (1)

No (0)

Q160 How old were you the first time it happened?

Q161 Were you in danger of death or serious physical injury?

Yes (1)

No (0)

Q162 Did you feel intense fear, helplessness, or horror?

Yes (1)

No (0)

Q163 How old were you the last time this person stalked you?

Q164 Has anyone else stalked you?

Yes (1)

No (0)

Q165 Have you ever been in any other situation in which you were in danger of death or serious physical injury, or in which you felt intense fear, helplessness, or horror?

Yes (1)

No (0)

Q166 How old were you when it happened?

Q167 Was there any other situation in which you were in danger of death or serious physical injury, or in which you felt intense fear, helplessness, or horror?

Yes (1)

No (0)

Custom Questionnaire for Emergent Behavioral Tasks

vidgame1 Have you ever played video games?

- No (1)
 - Yes (2)
-

vidgame2 How many hours per week do you currently play video games?

- 0 (1)
 - 1-5 (2)
 - 6-10 (3)
 - 11-15 (4)
 - 16-20 (5)
 - 21 or more (6)
-

vidgame3 What types of video games do you currently play? Check all that apply.

- App-based games (1)
 - Console games (2)
 - Computer games (3)
-

vidgame4 Think about a time in your life when you were playing video games on a regular basis, how many hours per week were you playing video games when you were playing the most?

- 0 (1)
 - 1-5 (2)
 - 6-10 (3)
 - 11-15 (4)
 - 16-20 (5)
 - 21 or more (6)
-

vidgame5 What types of video games did you play at that time? Check all that apply.

- App-based games (1)
 - Console games (2)
 - Computer games (3)
-

heights How often do you participate in activities with exposure to heights?

- Never (1)
 - A couple of times a year (3)
 - Once a month (4)
 - Once a week (5)
 - Multiple times per week (8)
-

fear Do you have a fear of heights?

No (1)

Yes (2)

motion Do you frequently experience motion sickness?

No (1)

Yes (2)

hike Do you often go hiking or backpacking?

No (1)

Yes (2)

CITY TASK COMPLETED AT THIS TIME

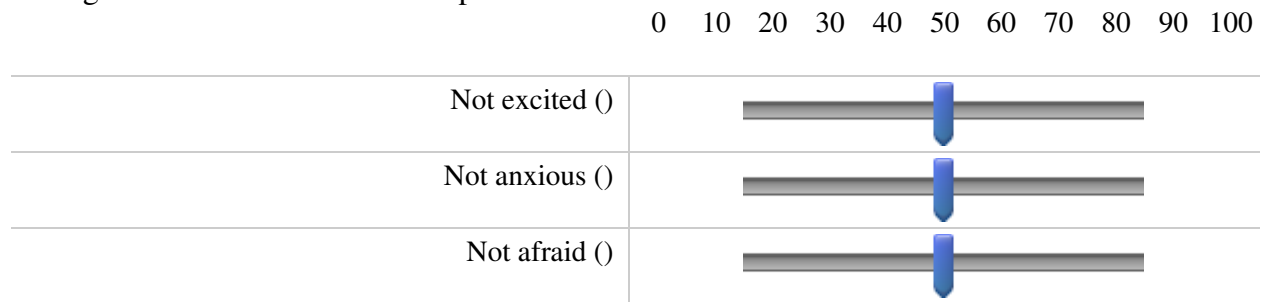
City Task Questions

imm_1 How focused were you on this task?

- Not at all focused (1)
 - Somewhat focused (2)
 - Focused about half the time (3)
 - Mostly focused (4)
 - Very focused (5)
-

emot_1 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.



arous_1 Did you feel a heightened sense of arousal during the task?

- No (1)
 - Yes (2)
-

phys1_1 Did you experience any physical signs of arousal during the task? (e.g. sweating, increased heart rate, tight muscles, etc.)

- No (1)
- Yes (2)

phys2_1 What physical signs of arousal did you experience?

ser_1 How seriously did you take this task?

- Not at all seriously (1)
- Somewhat seriously (2)
- Seriously about half the time (3)
- Mostly seriously (5)
- Very seriously (6)

avoid1_1 Did you purposely avoid going near the edge of the building?

- No (1)
- Yes (2)

avoid2_1 Why did you avoid going near the edge of the building?

goal_1 What was your goal during the task?

PATH TASK COMPLETED AT THIS TIME

Path Task Questions

behav_2 How similar was your behavior in this task compared to how you would have behaved in this situation in real life?

- Not at all similar (1)
 - Somewhat similar (3)
 - Neither similar or dissimilar (4)
 - Mostly similar (5)
 - Very similar (6)
-




imm_2 How focused were you on this task?

- Not at all focused (1)
 - Somewhat focused (2)
 - Focused about half the time (3)
 - Mostly focused (4)
 - Very focused (5)
-

emot_2 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.

0 10 20 30 40 50 60 70 80 90 100

Not excited ()	
Not anxious ()	
Not afraid ()	

arous_2 Did you feel a heightened sense of arousal during the task?

- No (1)
- Yes (2)

phys1_2 Did you experience any physical signs of arousal during the task? (e.g. sweating, increased heart rate, tight muscles, etc.)

- No (1)
- Yes (2)

phys2_2 What physical signs of arousal did you experience?

ser_2 How seriously did you take this task?

- Not at all seriously (1)
 - Somewhat seriously (2)
 - Seriously about half the time (3)
 - Mostly seriously (5)
 - Very seriously (6)
-

avoid1_2 Did you purposely avoid going into the forest?

- No (1)
 - Yes (2)
-

avoid2_2 Why did you avoid going into the forest?

goal_2 What was your goal during the task?

Overall Task Questions

real1 Which game felt the most realistic to you?

real2 Why did this game feel the most realistic?

error Was there anything about this study that you would have changed?

APPENDIX C – STUDY 3 QUESTIONNAIRE

Q219 Participant ID

Q221 What is your date of birth? (mm/dd/yyyy)

(Used to calculate age at the time survey was completed for age comparison purposes)

Q223

How do you define your Race?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose all that apply}

- American Indian or Alaska Native (1)
 - Asian (2)
 - Black or African American (3)
 - Native Hawaiian or Other Pacific Islander (4)
 - White (5)
 - Another (6) _____
 - Do not wish to respond (7)
-

Q225

How do you define your Ethnicity?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose one}

- Hispanic or Latinx (1)
 - Not Hispanic or Latinx (2)
 - Another (3) _____
 - Do not wish to respond (4)
-

Q227

How do you define your Sexual Orientation/Preference?

(We are attempting to better understand relations between sexual orientation/preference and behavior)

Write in:

Q229 Do you identify as part of the LGBTQ+ Community?

- Yes (1)
- No (2)
- Do not wish to respond (4)

Q231

Choose a number that best describes your Sexual Orientation/Preference:

(We are attempting to better understand relations between sexual orientation/preference and

behavior)

- Exclusively Homosexual 1 (1)
 - 2 (2)
 - 3 (3)
 - Bisexual 4 (4)
 - 5 (5)
 - 6 (6)
 - Exclusively Heterosexual 7 (7)
 - Asexual (8)
 - Pansexual (10)
 - Do not wish to respond (12)
-

Q243 How do you define your Gender Identity?

Note that Cisgender terms Cis Man and Cis Woman denote individuals whose sense of gender identity corresponds with the sex assigned to them at birth.

(We are attempting to better understand relations between gender identity and behavior)

{Choose all that apply}

- Agender (1)
- Androgynous (2)
- Cis Man (3)
- Cis Woman (4)
- Demiboy (30)
- Demigirl (31)
- Gender Fluid (5)
- Gender Non-Binary (8)
- Gender Non-Conforming (10)
- Gender Fluid (11)
- Gender Non-Binary (15)
- Gender Non-Conforming (16)
- Genderless (29)
- Genderqueer (17)
- Man (18)
- Third Gender (19)
- Trans Man (20)

- Trans Woman (21)
 - Transgender (22)
 - Transperson (23)
 - Two Spirit (24)
 - Woman (25)
 - Other (26) _____
 - Choose not to respond (27)
-

Q245 What was the sex assigned to you at birth?

(Used for Reporting of Demographic Statistics to Federal Funding Agencies)

{Choose One}

- Male (1)
- Female (2)
- Intersex (5)
- Another (3) _____
- Do not wish to respond (4)

Mental Health 1 Have you ever been diagnosed with and/or treated by a professional for any of the following conditions? Please check all that apply:

- Depression (1)
 - Anxiety (2)
 - Bipolar Disorder (3)
 - Post-Traumatic Stress Disorder (PTSD) (4)
 - Obsessive Compulsive Disorder (OCD) (5)
 - Attention Deficit and Hyperactivity Disorder (ADHD) (6)
 - Schizophrenia and/or any other Psychosis Spectrum Disorder (7)
 - Borderline Personality Disorder (8)
 - Antisocial Personality Disorder (9)
 - Other Personality Disorder (10)
-
- Substance Misuse and/or Addiction (Alcohol and/or Drugs) (11)
 - Other Addiction (e.g., internet, gaming, sexual, gambling) (12)
-
- Anorexia, Bulimia, and/or any other Eating Disorder (13)
 - Insomnia and/or any other Sleep Disorder (14)
 - Other Mental Health Condition (15)
-
- Learning Disability (16)

None of the Above (17)

Mental Health 2 Which of the following conditions are you *currently* diagnosed with and/or receiving treatment by a professional for? Please check all that apply:

- Depression (1)
 - Anxiety (2)
 - Bipolar Disorder (3)
 - Post-Traumatic Stress Disorder (PTSD) (4)
 - Obsessive Compulsive Disorder (OCD) (5)
 - Attention Deficit and Hyperactivity Disorder (ADHD) (6)
 - Schizophrenia and/or any other Psychosis Spectrum Disorder (7)
 - Borderline Personality Disorder (8)
 - Antisocial Personality Disorder (9)
 - Other Personality Disorder (10)
-
- Substance Misuse and/or Addiction (Alcohol and/or Drugs) (11)
 - Other Addiction (e.g., internet, gaming, sexual, gambling) (12)
-
- Anorexia, Bulimia, and/or any other Eating Disorder (13)
 - Insomnia and/or any other Sleep Disorder (14)
 - Other Mental Health Condition (15)
-
- Learning Disability (16)

None of the Above (17)

SSPT

The following scale consists of a series of statements regarding preference for engaging in new or exciting tasks. For each of the following items, you will be asked to indicate how much you agree or disagree with the statement. There are no right or wrong answers and we ask that you respond honestly.

SSPT1 I enjoy participating in unsafe activities.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT2 I don't enjoy trying new things.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT3 I think it is important to try as many new things as I can.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT4 I do things even if I know that doing them will get me in trouble.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT5 I love challenging myself with new and interesting tasks.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT6 I think that excitement is more important than safety.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT7 I have the most fun when I am doing risky or dangerous things.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT8 I rarely do things that seem risky.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT9 I like to experience anything and everything I can.

- Strongly Disagree (1)
 - Disagree (2)
 - Neutral (3)
 - Agree (4)
 - Strongly Agree (5)
-

SSPT10 I like to explore new areas.

- Strongly Disagree (1)
- Disagree (2)
- Neutral (3)
- Agree (4)
- Strongly Agree (5)

TIPI

Here are a number of personality traits that may or may not apply to you. Please indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

	Disagree strongly (1)	Disagree moderately (2)	Disagree a little (3)	Neither agree nor disagree (4)	Agree a little (5)	Agree moderately (6)	Agree strongly (7)
Extraverted, enthusiastic (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critical, quarrelsome (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dependable, self- disciplined (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Anxious, easily upset (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Open to new experiences, complex (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reserved, quiet (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sympathetic, warm (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disorganized, careless (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Calm, emotionally stable (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conventional, uncreative (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SUPPS-P

Q119 Below are a number of statements that describe ways in which people act and think. For each statement, please indicate how much you agree or disagree with the statement. Be sure to indicate your agreement or disagreement for every statement below.

Q1 I finish what I start.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q2 I generally like to see things through to the end.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q3 I like to stop and think things over before I do them.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q4 I tend to act without thinking when I am really excited.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q5 I tend to lose control when I am in a great mood.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q6 I tend to value and follow a rational, "sensible" approach to things.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q7 I usually think carefully before doing anything.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q8 My thinking is usually careful and purposeful.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q9 I quite enjoy taking risks.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q10 Once I get going on something I hate to stop.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q11 Others are shocked or worried about the things I do when I am feeling very excited.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q12 Sometimes when I feel bad, I can't seem to stop what I am doing even though it is making me feel worse.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q13 Unfinished tasks really bother me.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q14 I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q15 When I feel rejected, I will often say things that I later regret.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q16 I would like to learn to fly an airplane.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q17 When I am in great mood, I tend to get into situations that could cause me problems.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q18 I would enjoy the sensation of skiing very fast down a high mountain slope.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q19 When I am upset I often act without thinking.

- Agree Strongly (1)
 - Agree Some (2)
 - Disagree Some (3)
 - Disagree Strongly (4)
-

Q20 When I feel bad, I will often do things I later regret in order to make myself feel better now.

- Agree Strongly (1)
- Agree Some (2)
- Disagree Some (3)
- Disagree Strongly (4)

CUDIT-R

Q276 Have you used any cannabis over the past six months?

- No (1)
 - Yes (2)
-

Q277 How often do you use cannabis?

- Never (1)
 - Monthly or less (2)
 - 2-4 times per month (3)
 - 2-3 times per week (4)
 - 4+ times per week (5)
-

Q279 Please answer the following questions about your cannabis use. click the response that is most correct for you in relation to your cannabis use over the past six months.

	Never (1)	Less than Monthly (2)	Monthly (3)	Weekly (4)	Daily/almost daily (5)
How often during the past 6 months did you find that you were not able to stop using cannabis once you had started? (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often during the past 6 months did you fail to do what was normally expected from you because of using cannabis? (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often in the past 6 months have you devoted a great deal of your time to getting, using, or recovering from cannabis? (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often in the past 6 months have you had a problem with your memory or concentration after using cannabis? (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often do you use cannabis in situations that could be physically hazardous, such as driving, operating machinery, or caring for children? (5)

Q280 have you ever thought about cutting down, or stopping, your use of cannabis?

- Never (1)
- Yes, but not in the last 6 months (2)
- Yes, during the last 6 months (3)

Alcohol and Cannabis Norms

Q1 With respect to alcohol consumption, 1 standard drink is equivalent to 12 oz beer OR 8-9 oz of malt liquor/high alcohol beer OR 5oz of wine OR 1.5 oz shot of liquor straight or in a mixed drink. Please review the image carefully as it will help you understand what exactly counts as a standard drink of alcohol.

Q2 How many standard drinks did **you** consume each day during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Number of Standard Drinks (1)							

Q3 How many standard drinks do **you** think is acceptable to consume on each day during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Number of Standard Drinks (1)							

Q4 On which days did **you** consume marijuana during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you used marijuana, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5 On which days do **you** think it is acceptable to use marijuana in TYPICAL week?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you think it is acceptable, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6 On which days did **you** consume both alcohol and marijuana during a TYPICAL week in the last 30 days?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you used both, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q7 On which days do **you** think it is acceptable to consume both alcohol and marijuana in TYPICAL week?

	Sunday (1)	Monday (2)	Tuesday (3)	Wednesday (4)	Thursday (5)	Friday (6)	Saturday (7)
Choose all days when you think it is acceptable to use both, if none leave blank (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RBI – Sexual Behavior

Q1 What is your sexual orientation?

Q2 Choose a number that best describes your sexual orientation/preferences:
(Enter "0" if you do not wish to answer or if you cannot describe your orientation/preference using this scale)

Exclusively Homosexual (1) - - Mostly Homosexual - - Bisexual (4) - - Mostly Heterosexual - -
Exclusively Heterosexual (7)

- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 0 (8)

Page Break

Q3 Have you ever performed oral sex on anyone?

No (1)

Yes (2)

Q4 How old were you the first time you performed oral sex on someone?

Q5 How many times in the last 30 days have you performed oral sex on someone?

Q6 How many different people have you performed oral sex on in the last 30 days?

Q7 How many times in the last 12 months have you performed oral sex on someone?

Q8 How many different people have you performed oral sex on in the last 12 months?

Q9 How many times in your life have you performed oral sex on someone?

Q10 How many different people have you performed oral sex on in your life?

Q11 Of the times that you have performed oral sex on someone, approximately how many times did you use protection? (i.e. barrier protection, such as condoms or dental dams. Not hormonal contraception)

- Never (1)
- Less than half of the times (2)
- Half of the times (3)
- More than half of the times (4)
- All of the times (5)

Q12 Have you ever had oral sex performed on you?

- No (1)
- Yes (2)

Q13 How old were you the first time oral sex was performed on you?

Q14 How many times in the last 30 days was oral sex performed on you?

Q15 How many different people have performed oral sex on you in the last 30 days?

Q16 How many times in the last 12 months was oral sex performed on you?

Q17 How many different people have performed oral sex on you in the last 12 months?

Q18 How many times in your life has oral sex been performed on you?

Q19 How many different people have performed oral sex on you in your life?

Q20 Of the times that you've had oral sex performed on you, approximately how many times did you use protection? (i.e. barrier protection, such as condoms or dental dams. Not hormonal

contraception, such as birth control pills or IUD)

- Never (1)
 - Less than half of the times (2)
 - Half of the times (3)
 - More than half of the times (4)
 - All of the times (5)
-

Q21 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q22 Have you ever had vaginal intercourse?

No (1)

Yes (2)

Q23 How old were you the first time you had vaginal intercourse?

Q24 How many times in the last 30 days have you had vaginal intercourse?

Q25 How many different people have you had vaginal intercourse with in the last 30 days?

Q26 How many times in the last 12 months have you had vaginal intercourse?

Q27 How many different people have you had vaginal intercourse with in the last 12 months?

Q28 How many times in your life have you had vaginal intercourse?

Q29 How many different people have you had vaginal intercourse with in your life?

Q30 Have you ever had UNPROTECTED vaginal intercourse?

No (1)

Yes (2)

Q31 How old were you the first time you had UNPROTECTED vaginal intercourse?

Q32 How many times in the last 30 days have you had UNPROTECTED vaginal intercourse?

Q33 How many different people have you had UNPROTECTED vaginal intercourse with in the last 30 days?

Q34 How many times in the last 12 months have you had UNPROTECTED vaginal intercourse?

Q35 How many different people have you had UNPROTECTED vaginal intercourse with in the last 12 months?

Q36 How many times in your life have you had UNPROTECTED vaginal intercourse?

Q37 How many different people have you had UNPROTECTED vaginal intercourse with in your life?

Q38 How many of these people were you in a serious, committed, monogamous relationship with at the time you were having UNPROTECTED vaginal intercourse with them?

Q39 Of these, how many did you have UNPROTECTED vaginal intercourse with when you first met, before you were in a relationship with them?

Q40 Have you ever had UNDER PROTECTED vaginal intercourse?

No (1)

Yes (2)

Q41 How old were you the first time you had UNDER PROTECTED vaginal intercourse?

Q42 How many times in the last 30 days have you had UNDER PROTECTED vaginal intercourse?

Q43 How many different people have you had UNDER PROTECTED vaginal intercourse with in the last 30 days?

Q44 How many times in the last 12 months have you had UNDER PROTECTED vaginal intercourse?

Q45 How many different people have you had UNDER PROTECTED vaginal intercourse with in the last 12 months?

Q46 How many times in your life have you had UNDER PROTECTED vaginal intercourse?

Q47 How many different people have you had UNDER PROTECTED vaginal intercourse with in your life?

Q48 How many of these people were you in a serious, committed, monogamous relationship with at the time you were having UNDER PROTECTED vaginal intercourse with them?

Q49 Of these, how many did you have UNDER PROTECTED vaginal intercourse with when you first met, before you were in a relationship with them?

Q50 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from

sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q51 Have you ever had anal intercourse?

No (1)

Yes (2)

Q52 How old were you the first time you had anal intercourse?

Q53 How many times in the last 30 days have you had anal intercourse?

Q54 How many different people have you had anal intercourse with in the last 30 days?

Q55 How many times in the last 12 months have you had anal intercourse?

Q56 How many different people have you had anal intercourse with in the last 12 months?

Q57 How many times in your life have you had anal intercourse?

Q58 How many different people have you had anal intercourse with in your life?

Q59 Have you ever had UNPROTECTED anal intercourse?

No (1)

Yes (2)

Q60 How old were you the first time you had UNPROTECTED anal intercourse?

Q61 How many times in the last 30 days have you had UNPROTECTED anal intercourse?

Q62 How many different people have you had UNPROTECTED anal intercourse with in the last 30 days?

Q63 How many times in the last 12 months have you had UNPROTECTED anal intercourse?

Q64 How many different people have you had UNPROTECTED anal intercourse with in the last 12 months?

Q65 How many times in your life have you had UNPROTECTED anal intercourse?

Q66 How many different people have you had UNPROTECTED anal intercourse with in your life?

Q67 How many of these people were you in a serious, committed, monogamous relationship with at the time you were having UNPROTECTED anal intercourse with them?

Q68 Of these, how many did you have UNPROTECTED anal intercourse with when you first met, before you were in a relationship with them?

Q69 Have you ever engaged in any other intimate or sexual acts with a person of a different sex than you?

If so, please list what. (ex. kissing, body contact, mutual masturbation, etc.)

No (1)

Yes (2) _____

Q70 Have you ever had sexual intercourse with more than one person at the same time?

No (1)

Yes (2)

Q71 How old were you the first time you had sexual intercourse with more than one person at the same time?

Q72 How many times in the last 30 days have you had sexual intercourse with more than one person at the same time?

Q73 How many different people have you had sexual intercourse with more than one person at the same time within the last 30 days?

Q74 How many times in the last 12 months have you had sexual intercourse with more than one person at the same time?

Q75 How many different people have you had sexual intercourse with more than one person at the same time within the last 12 months?

Q76 How many times in your life have you had sexual intercourse with more than one person at the same time?

Q77 How many different people have you had sexual intercourse with more than one person at the same time within your life?

Q78 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q79 Have you ever had a sexual encounter (oral, vaginal and/or anal sex) with a member of the same sex as you?

No (1)

Yes (2)

Q80 How old were you the first time you had a sexual encounter with someone of the same sex as you?

Q81 How many times in the last 30 days have you had a sexual encounter with someone of the same sex as you?

Q82 How many different people of the same sex have you had a sexual encounter with in the last 30 days?

Q83 How many times in the last 12 months have you had a sexual encounter with someone of the same sex as you?

Q84 How many different people of the same sex have you had a sexual encounter with in the last 12 months?

Q85 How many times in your life have you had a sexual encounter with someone of the same sex as you?

Q86 How many different people of the same sex have you had a sexual encounter with in your life?

Q87 Have you ever had an UNPROTECTED sexual encounter with a member of the same sex as you?

No (1)

Yes (2)

Q88 How many different same sex partners have you had an UNPROTECTED sexual encounter with in your life?

Q89 How many of these same sex partners were you in a serious, committed, monogamous relationship with at the time you were having an UNPROTECTED sexual encounter with them?

Q90 Of these, how many did you have an UNPROTECTED sexual encounter with when you first met, before you were in a relationship with them?

Q91 Have you ever engaged in any other intimate or sexual acts with a person of the same sex as you?

If so, please list what. (ex. kissing, body contact, mutual masturbation, etc.)

No (1)

Yes (2) _____

Q92 For the purposes of this questionnaire, please use the following definitions: "UNPROTECTED" For FEMALES: engaging in sexual acts or behavior without the use of a condom AND also without the use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior without the use of a condom AND also without the knowledge of your partner's use of hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.); put another way, this means having no protection from pregnancy or sexually transmitted infection (STI). "UNDER PROTECTED" For FEMALES: engaging in sexual acts or behavior with protection from hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI). For MALES: engaging in sexual acts or behavior with protection from your partner's hormonal contraception (i.e. birth control pills, the patch, the ring, IUD, etc.) only; put another way, this means using no condom or dental dam and having no protection from sexually transmitted infections (STI).

For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime, use your best estimate.

Q93 Have you ever had a one-night stand--a single sexual encounter (oral, vaginal, and/or anal sex) without an immediate plan for forming a long-term sexual or romantic relationship with the other individual?

No (1)

Yes (2)

Q94 How old were you the first time you had a one-night stand?

Q95 How many times in the last 30 days have you had a one-night stand?

Q96 How many different people have you had a one-night stand with in the last 30 days?

Q97 How many times in the last 12 months have you had a one-night stand?

Q98 How many different people have you had a one-night stand with in the last 12 months?

Q99 How many times in your life have you had a one-night stand?

Q100 How many different people in your life have you had a one-night stand with?

Q101 Of all the people you have had a one-night stand with, how many did you know before the encounter?

Q102 Have you ever had an UNPROTECTED sexual encounter during a one-night stand?

No (1)

Yes (2)

Q103 How many different people have you had an UNPROTECTED sexual encounter as part of a one-night stand with in your life?

Q104 Have you ever had UNDER PROTECTED vaginal intercourse during a one-night stand?

No (1)

Yes (2)

Q105 How many different people have you had UNDER PROTECTED vaginal intercourse as part of a one-night stand with in your life?

Q106 Have you ever engaged in any other intimate or sexual acts with as part of a one-night stand?

If so, please list what. (ex. kissing, body contact, mutual masturbation, etc.)

No (1)

Yes (2) _____

Q107 While in a committed relationship, have you ever had a sexual encounter (oral, vaginal and/or anal sex) with a person who was not your partner?

No (1)

Yes (2)

Q108 How many times in your life have you been in a committed relationship and had a sexual encounter with someone who was not your partner?

Q109 Of these encounters, how many times were UNPROTECTED sexual encounters?

Q110 Of these encounters, how many times were UNDER PROTECTED vaginal sex?

Q111 Have you ever had a sexual encounter (oral, vaginal, and/or anal sex) in a public place?

No (1)

Yes (2)

Q112 How old were you the first time you had a sexual encounter in a public place?

Q113 How many times in the last 30 days have you had a sexual encounter in a public place?

Q114 How many different people have you had a sexual encounter with in a public place with in the last 30 days?

Q115 How many times in the last 12 months have you had a sexual encounter in a public place?

Q116 How many different people have you had a sexual encounter with in a public place with in the last 12 months?

Q117 How many times in your life have you had a sexual encounter in a public place?

Q118 How many different people have you had sex in a public place with in your life?

Q119 How often do you use condoms when having vaginal or anal intercourse with a serious partner (i.e., a long term partner or someone you are in a relationship with)?

- Never (1)
- Almost Never (2)
- Sometimes (3)
- Almost Always (4)
- Always (5)
- I Have Never Had a Serious Partner (6)

Q120 How often do you use condoms when having vaginal or anal intercourse with casual partners (i.e., in a one-night stand, or a person you are having sex with outside of a romantic relationship)?

- Never (1)
 - Almost Never (2)
 - Sometimes (3)
 - Almost Always (4)
 - Always (5)
 - Not Applicable to Me (6)
-

Q121 How often do you use other forms of contraception besides condoms (i.e., birth control pills/patch/shot/ring, IUDs, spermicidal foam, etc.) when having vaginal intercourse?

- Never (1)
 - Almost Never (2)
 - Sometimes (3)
 - Almost Always (4)
 - Always (5)
 - Not Applicable to Me (6)
-

Q122 Have you ever gotten tested for sexually transmitted diseases or infections?

- No (1)
 - Yes (2)
-

Q123 How often do you get tested?

- Once per month or more (1)
 - 3-4 times per year (3)
 - Twice per year (2)
 - Once per year (4)
 - Less than once per year (5)
-

Q124 Have you ever tested positive for a sexually transmitted disease or infection?

- No (1)
 - Yes (2)
-

Q125 What did you test positive for? (Please check all that apply)

- Bacterial Vaginosis (BV) (1)
 - Chlamydia (2)
 - Hepatitis, Viral (3)
 - Herpes, Genital (4)
 - HIV/AIDS (5)
 - Human Papillomavirus (HPV) (6)
 - Pelvic Inflammatory Disease (PID) (7)
 - Syphilis (8)
 - Trichomoniasis (9)
 - Other (10)
-

Q126 Have you ever taken naked pictures of yourself?

- No (1)
 - Yes (2)
-

Q127 Did you send these naked pictures to anyone?

- No (1)
 - Yes (2)
-

Q128 Was that person a stranger (someone you did not know)?

No (1)

Yes (2)

Q129 Have you ever made a video of yourself while having a sexual encounter (oral, vaginal, and/or anal sex)?

No (1)

Yes (2)

Q130 Did you send this video to anyone?

No (1)

Yes (2)

Q131 Was that person a stranger (someone you did not know)?

No (1)

Yes (2)

Q132 Have you ever posed for or taken nude or semi-nude photos, videos, or webcams (including sexual encounters) knowing that they would be posted online?

No (1)

Yes (2)

Q133 Have you ever taken nude or semi-nude photos, videos, or webcams (including sexual encounters) of your sexual partner?

No (1)

Yes (2)

Q134 Did your partner consent to this activity?

No (1)

Yes (2)

Q135 Did you ever post these online?

No (1)

Yes (2)

Q136 Did you ever post these online without your partner's permission?

No (1)

Yes (2)

Q137 Have you ever taken part in uncommon sexual acts/fetishes (e.g., bestiality, bondage, furryism, sadism and masochism/S&M, autoerotic asphyxiation/choking, etc.)?

No (1)

Yes (2)

Q138 What is/are the uncommon sexual acts/fetishes that you have engaged in?

Q139 Do you take part in these acts for the excitement/rush/dangerousness of the experience?

- Not at all (1)
- Somewhat (2)
- Mostly (3)
- Completely (4)

Q140 Do you ask your partners if they have been recently tested for sexual transmitted diseases or infections before having sex?

- No (1)
 - Yes (2)
-

Q141 What reason have you had for not asking your partner(s) if they have been recently tested for sexual transmitted diseases or infections? (Please check all that apply).

- Not concerned based upon knowledge of previous sexual history (1)
- Not concerned based upon physical appearance (2)
- Did not want to upset/offend your partner (3)
- Were too preoccupied-occupied sexually/emotionally (4)
- Did not want to ruin the mood (5)
- Felt that the associated risks were very low (6)
- Enjoyed the excitement of the experience (7)
- Forgot to ask (8)
- Other (9)

RBI Substance Use

Q1 The following items assess substance use behaviors. Please answer all of the items honestly and as accurately as possible. Remember, NONE of this information could be used to identify you or be linked to you.

Q2 For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 6 months:If you do it daily, please enter 183, twice a day would be 365, three times a day would be 548, etc.

When asked about how many times in the last 12 months:If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime:If daily for one year please enter 365, if daily for multiple years please enter 365 multiplied by the number of years.If more than once per day, please enter times per day multiplied by 365, then multiplied by number of years.Please use your best estimate.

Q3 Have you ever smoked a cigarette?

No (1)

Yes (2)

Q4 How old were you the first time you smoked a cigarette?

Q5 On a typical day, how many cigarettes do you smoke? (Enter a number, e.g. 5., if every other day, enter .5)

Q6 Do you currently consider yourself:

- A non-smoker (currently do not smoke any cigarettes at all) (1)
 - A smoker who is currently quitting (2)
 - A social smoker (only smokes when with other people) (3)
 - A casual smoker (not daily use, not limited to social use) (4)
 - A smoker (daily use) (6)
-

Q7 Think about the time in your life when you smoked the most. How would you consider yourself?

- A non-smoker (currently do not smoke any cigarettes at all) (1)
 - A social smoker (only smokes when with other people) (3)
 - A casual smoker (not daily use, not limited to social use) (4)
 - A smoker (daily use) (6)
-

Q8 Have you ever used tobacco not in cigarette form (i.e., chewing tobacco, pipe tobacco, cigars, cigarillos, hookah)?

- No (1)
 - Yes (2)
-

Q9 How old were you the first time you used tobacco not in cigarette form (i.e., chewing tobacco)?

Q10 On a typical day, how times do you use tobacco in a non-cigarette form? (Enter a number, e.g. 5., if every other day, enter .5)

Q11 Do you currently consider yourself:

- A non-user (currently do not use any tobacco at all) (1)
 - A user who is currently quitting (2)
 - A social user (only uses when with other people) (3)
 - A casual use (not daily use, not limited to social use) (4)
 - A user (daily use) (6)
-

Q12 Think about the time in your life when you smoked the most. How would you consider yourself?

- A non-user (currently do not use any tobacco at all) (1)
 - A user who is currently quitting (2)
 - A social user (only uses when with other people) (3)
 - A casual use (not daily use, not limited to social use) (4)
 - A user (daily use) (6)
-

Q13 Have you ever used an electronic cigarette (i.e. e-cig)?

No (1)

Yes (2)

Q14 How old were you the first time you used an electronic cigarette?

Q15 On a typical day, how many times per day do you use your electronic cigarette?

Q16 When using your electronic cigarette, how many "puffs"/"drags" do you typically take?

Q17 How many milligrams (mg) of nicotine are in the electronic cigarettes you typically use?

- 0 mg (nicotine free) (1)
 - approximately 6 mg (2)
 - approximately 12 mg (3)
 - approximately 18 mg (4)
 - approximately 24 mg (5)
 - more than 24 mg (6)
 - I'm not sure (7)
-

Q18 Have you ever used marijuana (smoked or other method)?

- No (1)
 - Yes (2)
-

Q19 For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 6 months: If you do it daily, please enter 183, twice a day would be 365, three times a day would be 548, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime: If daily for one year please enter 365, if daily for multiple years please enter 365 multiplied by the number of years. If more than once per day, please enter times per day multiplied by 365, then multiplied by number of years. Please use your best estimate.

Q20 How old were you the first time you used marijuana?

Q21 How many times have you used marijuana in the last 30 days?

Q22 How many times have you used marijuana in the last 6 months?

Q23 How many times have you used marijuana in the last year?

Q24 How many times in your life have you used marijuana?

Q25 For an average week, on how many weekdays do you use marijuana?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q26 For an average week, how many times do you use marijuana?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q27 Have you ever used ecstasy? (i.e. MDMA, X, MDA, Molly, rolls, etc.)

No (1)

Yes (2)

Q28 How old were you the first time you used ecstasy?

Q29 How many times have you used ecstasy in the last 30 days?

Q30 How many times have you used ecstasy in the last 6 months?

Q31 How many times have you used ecstasy in the last year?

Q32 How many times in your life have you used ecstasy?

Q33 For an average week, on how many weekdays do you use ecstasy?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q34 For an average week, how many times do you use ecstasy?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q35 Have you ever used Ketamine/Special K?

No (1)

Yes (2)

Q36 How old were you the first time you used Ketamine/Special K?

Q37 How many times have you used Ketamine/Special K in the last 30 days?

Q38 How many times have you used Ketamine/Special K in the last 6 months?

Q39 How many times have you used Ketamine/Special K in the last year?

Q40 How many times in your life have you used Ketamine/Special K?

Q41 For an average week, on how many weekdays do you use Ketamine/Special K?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q42 For an average week, how many times do you use Ketamine/Special K?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q43 Have you ever used heroin?

No (1)

Yes (2)

Q44 How old were you the first time you used heroin?

Q45 How many times have you used heroin in the last 30 days?

Q46 How many times have you used heroin in the 6 months?

Q47 How many times have you used heroin in the last year?

Q48 How many times in your life have you used heroin?

Q49 How have you used heroin? (check all that apply)

- Smoked (1)
 - Snorted (2)
 - Injected into your veins (3)
 - Injected not into your veins (4)
 - Other (5) _____
-

Q50 For an average week, on how many weekdays do you use heroin?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q51 For an average week, how many times do you use heroin?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q52 Have you ever used pills/prescription drugs not for medical reasons, but to get high?

- No (1)
 - Yes (2)
-

Q53 For questions about how many times:

When asked about how many times in the last 30 days:

If you do it daily, please enter 30, twice a day would be 60, three times a day would be 90, etc.

When asked about how many times in the last 6 months: If you do it daily, please enter 183, twice a day would be 365, three times a day would be 548, etc.

When asked about how many times in the last 12 months: If you do it daily, please enter 365, twice a day would be 730, three times a day would be 1095, etc.

When asked about how many times in your lifetime: If daily for one year please enter 365, if daily for multiple years please enter 365 multiplied by the number of years. If more than once per day, please enter times per day multiplied by 365, then multiplied by number of years. Please use your best estimate.

Q54 How old were you the first time you used pills/prescription drugs not for medical reasons, but to get high?

Q55 How many times have you used pills/prescription drugs not for medical reasons, but to get high in the last 30 days?

Q56 How many times have you used pills/prescription drugs not for medical reasons, but to get high in the last 6 months?

Q57 How many times have you used pills/prescription drugs not for medical reasons, but to get high in the last year?

Q58 How many times in your life have you used pills/prescription drugs not for medical reasons, but to get high?

Q59 For an average week, on how many weekdays do you use pills/prescription drugs not for medical reasons, but to get high?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q60 For an average week, how many times do you use pills/prescription drugs not for medical reasons, but to get high?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q61 What pills/prescription drugs have you taken to get high? (check all that apply)

Opioids / pain killers (e.g. codeine, morphine, hydrocodone/Vicodin, oxycodone/Percocet, Oxycontin, darvon, demeral, dilaudid, lomofil, methadone, etc.) (1)

Stimulants / "uppers" (e.g. adderall, dexadrine, ritaline, Concerta, Vyvanse, methylenidate, etc.) (4)

Depressants / "downers" (e.g. barbiturates, benzodiazepines, muscle relaxers, tranquilizers, xanax, valium, phenobarbital, nembotal, quaalude, roofies, etc.) (2)

Other (3) _____

Q62 Have you ever used cocaine? (do not include crack use in your answers)

No (1)

Yes (2)

Q63 How old were you the first time you used cocaine?

Q64 How many times have you used cocaine in the last 30 days?

Q65 How many times have you used cocaine in the last 6 months?

Q66 How many times have you used cocaine in the last year?

Q67 How many times in your life have you used cocaine?

Q68 For an average week, on how many weekdays do you use cocaine?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q69 For an average week, how many times do you use cocaine?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q70 How have you used cocaine? (check all that apply)

- Smoked (1)
 - Snorted (2)
 - Injected into your veins (3)
 - Injected not into your veins (4)
 - Other (5) _____
-

Q71 Have you ever smoked crack? (do not include cocaine use in your answers)

No (1)

Yes (2)

Q72 How old were you the first time you smoked crack?

Q73 How many times have you smoked crack in the last 30 days?

Q74 How many times have you smoked crack in the last 6 months?

Q75 How many times have you smoked crack in the last year?

Q76 How many times in your life have you smoked crack?

Q77 For an average week, on how many weekdays do you smoke crack?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
-

Q78 For an average week, how many times do you smoke crack?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q79 Have you ever inhaled (or huffed) anything in order to get high? (e.g. "whip-its" nitrous, poppers, freon, glue, gasoline, paint, nitrates, paint thinner, spray cans, etc.)

No (1)

Yes (2)

Q80 How old were you the first time you inhaled (or huffed) anything in order to get high?

Q81 How many times have you inhaled (or huffed) anything in order to get high in the last 30 days?

Q82 How many times have you inhaled (or huffed) anything in order to get high in the last 6 months?

Q83 How many times have you inhaled (or huffed) anything in order to get high in the last year?

Q84
get high?

How many times in your life have you inhaled (or huffed) anything in order to

Q85 For an average week, on how many weekdays do you inhale (or huff) anything in order to get high?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

Q86 For an average week, how many times do you inhale (or huff) anything in order to get high?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q87 Have you ever used hallucinogens (acid, LSD, "magic mushrooms", psilocybin, DMT, mescaline, peyote, 2CI, 2CB, etc.)?

- No (1)
 - Yes (2)
-

Q88 How old were you the first time you used hallucinogens?

Q89 How many times have you used hallucinogens in the last 30 days?

Q90 How many times have you used hallucinogens in the last 6 months?

Q91 How many times have you used hallucinogens in the last year?

Q92 How many times in your life have you used hallucinogens?

Q93 For an average week, how many times do you use hallucinogens?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q94 What hallucinogens have you used? (check all that apply)

- LSD / "acid" (1)
 - Psilocybin / "magic mushrooms" (2)
 - DMT (4)
 - Mescaline / Peyote (3)
 - Synthetic hallucinogens / research chemicals (e.g. 2CI, 2CB, 25i nbome, DOB, etc.) (5)
 - Other (6) _____
-

Q95 Have you ever used methamphetamine? (i.e. meth, crystal ice, crank, ice, etc.)

No (1)

Yes (2)

Q96 How old were you the first time you used methamphetamine?

Q97 How many times have you used methamphetamine in the last 30 days?

Q98 How many times have you used methamphetamine in the last 6 months?

Q99 How many times have you used methamphetamine in the last year?

Q100 How many times in your life have you used methamphetamine?

Q101 For an average week, on how many weekdays do you use methamphetamine?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

Q102 For an average week, how many times do you use methamphetamine?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

6 (7)

7 (8)

more than once a day (9)

Q103 How have you used methamphetamine? (check all that apply)

- Smoked (1)
 - Snorted (2)
 - Injected into your veins (3)
 - Injected not into your veins (4)
 - Other (5) _____
-

Q104 Have you ever used steroids for nonmedical reasons?

- No (1)
 - Yes (2)
-

Q105 How old were you the first time you used steroids?

Q106 How many times have you used steroids in the last 30 days?

Q107 How many times have you used steroids in the last 6 months?

Q108 How many times have you used steroids in the last year?

Q109 How many times in your life have you used steroids?

Q110 Have you ever used a substance not yet mentioned to get high?

No (1)

Yes (2)

Q111 What were the substance(s)?

Q112 How old were you the first time you used these substance(s)?

Q113 How many times have you used these substance(s) in the last 30 days?

Q114 How many times have you used these substance(s) in the last 6 months?

Q115 How many times have you used these substance(s) in the last year?

Q116 How many times in your life have you used these substance(s)?

Q117 For an average week, on how many weekdays do you use this substance?

0 (1)

1 (2)

2 (3)

3 (4)

4 (5)

5 (6)

Q118 For an average week, how many times do you use this substance?

- 0 (1)
 - 1 (2)
 - 2 (3)
 - 3 (4)
 - 4 (5)
 - 5 (6)
 - 6 (7)
 - 7 (8)
 - more than once a day (9)
-

Q119 Have you ever choked yourself or had others choke you (played the black-out, choking, or pass-out game) in order to get a rush or get high?

- No (1)
 - Yes (2)
-

Q120 How old were you the first time you choked yourself or had others choke you?

Q121 How many times have you choked yourself or had others choke you in the last 30 days?

Q122
last 6 months?

How many times have you choked yourself or had others choke you in the

Q123
last year?

How many times have you choked yourself or had others choke you in the

Q124
choke you?

How many times in your life have you choked yourself or had others

Q125 Have you ever used a combination of substances to get a better high?

No (1)

Yes (2)

Q126

How many times have you combined these drugs in the last 30 days?

Q127 How many times have you combined these drugs in the last 6 months?

Q128 How many times have you combined these drugs in the last year?

Q129 How many times in your life have you combined these drugs?

Q130 Have you ever used an unknown substance (i.e., someone just hands you something and you swallow, snort, smoke, or inject it without knowing what it is)?

No (1)

Yes (2)

Q131 How old were you the first time you used an unknown substance?

Q132 How many times have you used an unknown substance in the last 30 days?

Q133
months?

How many times have you used an unknown substance in the last 6

Q134

How many times have you used an unknown substance in the last year?

Q135

How many times in your life have you used an unknown substance?

Q136 Have you ever used alcohol or drugs to the point of being drunk or high when you were alone?

No (1)

Yes (2)

Q137 In the last 30 days, how many days were you alone when you used drugs or alcohol?

Q138 In the last 6 months, how many days were you alone when you used drugs or alcohol?

Q139 In the last year, how many days were you alone when you used drugs or alcohol?

Q140 On how many days in your lifetime were you alone when you used drugs or alcohol?

Q141 On how many of the last 30 days did you use any alcohol or drugs to the point of being drunk or high regardless of where you were or who you were with?

Q142 Have you ever gone to school or work while drunk or high?

No (1)

Yes (2)

Q143 How many times did you go to school or work while you were drunk or high in the last 30 days?

Q144
the night before?

How many of these times were because you woke up drunk or high from

Q145
were drunk or high?

How many times in your life did you go to school or work while you

Q146
the night before?

How many of these times were because you woke up drunk or high from

Q147 Have you ever missed school, work, or social engagements because you were drunk or high?

No (1)

Yes (2)

Q148 Have you ever used alcohol or drugs while driving? (do not count medication taken for medical reasons)

No (1)

Yes (2)

Q149 Have you ever used alcohol or drugs while pregnant or nursing? (do not count medication taken for medical reasons)

No (1)

Yes (2)

Q150 Have you ever used alcohol or drugs while babysitting or providing childcare? (do not count medication taken for medical reasons)

No (1)

Yes (2)

Q151 Have you ever self-harmed (cut yourself, burned yourself, bit yourself, etc.) while drunk or high?

No (1)

Yes (2)

Q152 Have you ever let someone else harm you (cut you, burn you, bite you, etc.) on purpose while drunk or high?

No (1)

Yes (2)

Q153 Have you ever engaged in sexual behavior while drunk or high that you would not have engaged in if you were sober (unprotected sex, sex with a stranger, sex with a friend/co-worker/acquaintance, sex for the first time, sex with someone you know has an illness or

sexually transmitted disease, sex for money, paid for sex, forced sexual behavior on someone, etc.)? Do Not Include Sexual Encounters that were forced on you.

No (1)

Yes (2)

Q154 What was/were the sexual behavior(s)?

Q155 Why would you not engage in it/them if you were sober?

Q156 Did you engage in this/these for the excitement/rush/dangerousness of the experience?

Not at all (1)

Somewhat (2)

Mostly (3)

Completely (4)

Q157 What substances and/or combinations of substances were you using when you engaged in sexual behavior that you would not have done if you were sober?

Check all that apply:

- Alcohol only (1)
 - Marijuana only (2)
 - Other drugs only (3)
 - Alcohol and marijuana together (4)
 - Alcohol and other drugs together (5)
 - Marijuana and other drugs together (6)
 - Alcohol, marijuana, and other drugs together (7)
 - Other (8) _____
-

Q158 Approximately how many times in your lifetime have you engaged in sexual behavior while using alcohol that you would not have done if you were sober?

Enter a number:

Q159 Approximately how many times in your lifetime have you engaged in sexual behavior while using marijuana that you would not have done if you were sober?

Enter a number:

Q160 Approximately how many times in your lifetime have you engaged in sexual behavior while using substances other than marijuana or alcohol that you would not have done if you were

sober?

Enter a number:

Q161 Approximately how many times in your lifetime have you engaged in sexual behavior while using combinations of alcohol, marijuana, and/or other substances that you would not have done if you were sober?

Enter a number:

Q162 Have you ever used alcohol or drugs in the morning/when you first wake up (not including caffeine or tobacco) to get drunk or high?

No (1)

Yes (2)

Q163 How many days have you used alcohol or drugs in the morning/when you first wake up during the last 30 days?

Q164 How many of those were weekdays? (if daily enter 20)

Q165 How many days in your life have you used alcohol or drugs in the morning/when you first wake up?

Q166 How many of those were weekdays?

Q167 Have you ever gotten into a fight while drunk or high?

No (1)

Yes (2)

Q168 Have you ever overdosed from alcohol or drugs?

No (1)

Yes (2)

Q169 How many times have you overdosed?

Q170 What drugs have you overdosed on?

Q171 Did you ever have to go to the emergency room because of overdose?

No (1)

Yes (2)

Q172 Did you ever have your stomach pumped because of this overdose?

No (1)

Yes (2)

Q173 Have you ever been in treatment for alcohol or drug abuse or dependence/addiction?

No (1)

Yes (2)

Q174 How many times have you been in alcohol or drug treatment?

Q175 How old were you when you first started a treatment program?

Suicidal Behavior Questions

Q1 Have you ever felt that life is hardly worth living?

- Yes, within the last year (1)
 - Yes, more than a year ago (2)
 - No, never (3)
-

Q2 Have you ever thought that you would be better off dead?

- Yes, within the last year (1)
 - Yes, more than a year ago (2)
 - No, never (3)
-

Q3 Have you ever seriously considered taking your own life?

- Yes, within the last year (1)
 - Yes, more than a year ago (2)
 - No, never (3)
-

Q4 Have you ever attempted to take your own life?

- Yes, within the last year (1)
- Yes, more than a year ago (2)
- No, never (3)

Custom Questionnaire for Emergent Behavioral Tasks

vidgame1 Have you ever played video games?

- No (1)
 - Yes (2)
-

vidgame2 How many hours per week do you currently play video games?

- 0 (1)
 - 1-5 (2)
 - 6-10 (3)
 - 11-15 (4)
 - 16-20 (5)
 - 21 or more (6)
-

vidgame3 What types of video games do you currently play? Check all that apply.

- App-based games (1)
 - Console games (2)
 - Computer games (3)
-

vidgame4 Think about a time in your life when you were playing video games on a regular basis, how many hours per week were you playing video games when you were playing the most?

- 0 (1)
 - 1-5 (2)
 - 6-10 (3)
 - 11-15 (4)
 - 16-20 (5)
 - 21 or more (6)
-

vidgame5 What types of video games did you play at that time? Check all that apply.

- App-based games (1)
 - Console games (2)
 - Computer games (3)
-

VR experience Have you ever used a VR system before?

- No (1)
 - Yes (2)
-

heights How often do you participate in activities with exposure to heights?

- Never (1)
 - A couple of times a year (3)
 - Once a month (4)
 - Once a week (5)
 - Multiple times per week (8)
-

fear Do you have a fear of heights?

- No (1)
 - Yes (2)
-

motion Do you frequently experience motion sickness?

- No (1)
 - Yes (2)
-

hike Do you often go hiking or backpacking?

- No (1)
- Yes (2)

VR CITY TASK COMPLETED AT THIS TIME

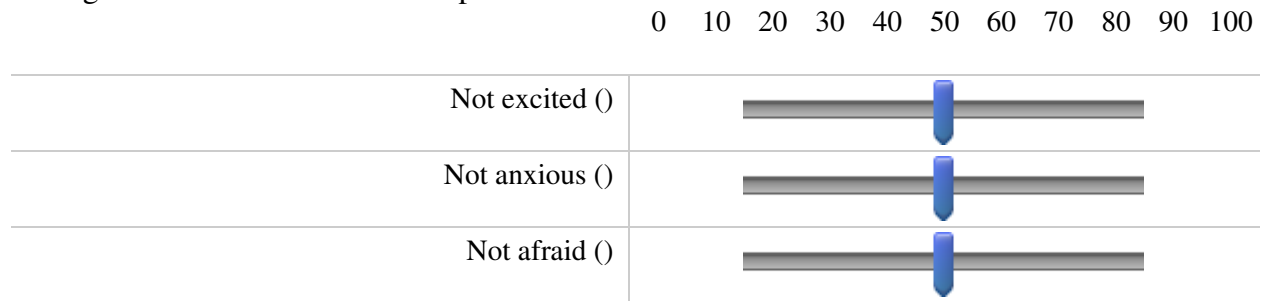
City Task Questionnaire

imm_1 How focused were you on this task?

- Not at all focused (1)
 - Somewhat focused (2)
 - Focused about half the time (3)
 - Mostly focused (4)
 - Very focused (5)
-

emot_1 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.



arous_1 Did you feel a heightened sense of arousal during the task?

- No (1)
 - Yes (2)
-

phys1_1 Did you experience any physical signs of arousal during the task? (e.g. sweating, increased heart rate, tight muscles, etc.)

- No (1)
- Yes (2)

phys2_1 What physical signs of arousal did you experience?

ser_1 How seriously did you take this task?

- Not at all seriously (1)
- Somewhat seriously (2)
- Seriously about half the time (3)
- Mostly seriously (5)
- Very seriously (6)

avoid1_1 Did you purposely avoid going near the edge of the building?

- No (1)
- Yes (2)

avoid2_1 Why did you avoid going near the edge of the building?

goal_1 What was your goal during the task?

VR PATH TASK COMPLETED AT THIS TIME

Path Task Questionnaire

behav_2 How similar was your behavior in this task compared to how you would have behaved in this situation in real life?

- Not at all similar (1)
 - Somewhat similar (3)
 - Neither similar or dissimilar (4)
 - Mostly similar (5)
 - Very similar (6)
-




imm_2 How focused were you on this task?

- Not at all focused (1)
 - Somewhat focused (2)
 - Focused about half the time (3)
 - Mostly focused (4)
 - Very focused (5)
-

emot_2 Indicate the extent to which you were experiencing each emotion during this task.

A score of 0 means you were not feeling the emotion at all. A score of 100 means that you were feeling as much of that emotion as possible.

0 10 20 30 40 50 60 70 80 90 100

Not excited ()	
Not anxious ()	
Not afraid ()	

arous_2 Did you feel a heightened sense of arousal during the task?

- No (1)
- Yes (2)

phys1_2 Did you experience any physical signs of arousal during the task? (e.g. sweating, increased heart rate, tight muscles, etc.)

- No (1)
- Yes (2)

phys2_2 What physical signs of arousal did you experience?

ser_2 How seriously did you take this task?

- Not at all seriously (1)
 - Somewhat seriously (2)
 - Seriously about half the time (3)
 - Mostly seriously (5)
 - Very seriously (6)
-

avoid1_2 Did you purposely avoid going into the forest?

- No (1)
 - Yes (2)
-

avoid2_2 Why did you avoid going into the forest?

goal_2 What was your goal during the task?

Overall Task Questions

real1 Which game felt the most realistic to you?

real2 Why did this game feel the most realistic?

error Was there anything about this study that you would have changed?
