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Cardiorespiratory fitness and body composition of stimulant users: A baseline analysis of the STRIDE cohort

Mark Stoutenberg, PhD, MSPH^a, Chad D. Rethorst, PhD^b, Denise C. Vidot, PHD^c, Tracy L. Greer, PHD^b, and Madhukar H. Trivedi, MD^b

^aDepartment of Public Health Sciences, University of Miami Miller School of Medicine, Miami, FL

^bDepartment of Psychiatry, University of Texas Southwestern Medical Center, Dallas, TX

^cSchool of Nursing & Health Studies, University of Miami, Coral Gables, FL

Abstract

Introduction—Relatively little has been reported about the physical characteristics, such as cardiorespiratory fitness (CRF) and body composition, of stimulant users. Identifying risk factors associated with the physical health of stimulant users is an important public health issue as new treatments should better address the entire range of health concerns experienced by this population.

Methods—We examined cross-sectional data gathered at baseline from the STimulant Reduction Intervention using Dosed Exercise (STRIDE) study, a multisite randomized clinical trial that examined exercise as an adjunct to treatment as usual for individuals in residential treatment programs (RTPs). Clients were approached after intake to the RTP. Prior to randomization, eligible individuals underwent a comprehensive screening process that included medical screening, where CRF was assessed through a maximal exercise test (time on treadmill), and a series of baseline examinations assessing domains of substance use and mental health.

Results—Data from 295 individuals with recent stimulant use disorders were analyzed. The mean body mass index (BMI) and waist circumference (WC) and for all participants was $27.8 \pm 5.7 \text{ kg/m}^2$ and $93.5 \pm 14.2 \text{ cm}$, respectively, while the mean time on treadmill was 13.7 ± 2.9 minutes. Few significant associations were observed between CRF, BMI, or WC and substance use and mental health measures.

Conclusions—Stimulant users in this study presented with low CRF levels and would be considered overweight based on their BMI. These individuals would likely benefit from interventions that address both their stimulant use, as well as their physical health.

Corresponding Author: Mark Stoutenberg, Ph.D., MSPH, University of Miami, Clinical Research Building, Suite 1008, 1120 NW 14th Street, Miami, FL 33139, 305-243-8949, mstoutenberg@med.miami.edu.

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Keywords

body mass index; cardiorespiratory fitness; stimulant use; waist circumference

1. Introduction

Stimulant use is a significant public health concern and major cause of morbidity and mortality worldwide. Individuals with a drug dependence die, on average, 22.5 years earlier than individuals without dependence (Neumark, Van Etten, & Anthony, 2000). Mortality in individuals who reported regular, lifetime cocaine use had a 90% increase risk of all-cause mortality, resulting in an estimated 10.3 years of life in adults 31 years of age (Qureshi, Chaudhry, & Suri, 2014). In addition to elevated mortality rates in stimulant users, there is a concomitant rise in cardiovascular events, such as acute coronary events (Billman, 1995; Mittleman et al., 1999). Cardiovascular complications associated with stimulant use include microvascular disease, coronary endothelial dysfunction, thrombosis, systolic and diastolic dysfunction, arrhythmias, and left ventricular hypertrophy (Havranek, Nademanee, Grayburn, & Eichhorn, 1996; Macmahon & Tallentire, 2010). Additional health complications associated with cocaine and other stimulants include accelerated atherosclerotic processes, pulmonary edema, and malnourishment (Devlin & Henry, 2008; Schwartz, Rezkalla, & Kloner, 2010).

Cardiorespiratory fitness (CRF), defined as the ability of the circulatory, respiratory, and muscular systems to supply oxygen during sustained physical activity (D. C. Lee, Artero, Sui, & Blair, 2010), is an objective measure of physical health. Low CRF levels have been strongly correlated with mortality (Blair et al., 1989) and several comorbid states including cardiovascular disease (Carnethon et al., 2003), diabetes (Sui et al., 2008), and metabolic syndrome (LaMonte et al., 2005). CRF has also been associated with depression (Dishman et al., 2012), schizophrenia (Scheewe, Takken, Kahn, Cahn, & Backx, 2012), and sleep (King, Oman, Brassington, Bliwise, & Haskell, 1997), which can all be impacted by stimulant use (Morgan et al., 2006). Two previous studies in substance using populations, one in methamphetamine users, reported CRF levels well below the population average (Dolezal et al., 2013; Flemmen & Wang, 2015), which may be related to the poor health conditions often observed in these individuals. However, both of these studies had relatively small sample sizes (39 and 44 individuals, respectively) creating a need for verification across a larger population of stimulant users.

Overweight and obese individuals are also at increased risk of mortality and several comorbid conditions (Prospective Studies Collaboration et al., 2009). Furthermore, studies have determined that larger waist circumference (WC), independent of bodyweight, is associated with higher mortality risk (Koster et al., 2008). Yet, the body composition of stimulant users, represented in this manuscript by body mass index (BMI) and waist circumference (WC), is not well understood. Cocaine use has been associated with lower bodyweight and BMI levels, independent of food intake (Forrester, Tucker, & Gorbach, 2005), potentially because of its anorexigenic effects (Vanbuskirk & Potenza, 2010). Lower BMI levels may also be due to perturbations in fat regulation and a selective reduction in

body fat despite increased self-reported food intake (Ersche, Stochl, Woodward, & Fletcher, 2013). Conversely, other studies have reported slightly above average BMI levels in methamphetamine using individuals (Dolezal et al., 2013). Adding to this complexity, gender also appears to be a moderating factor as female substance users have lower BMI and body fat levels than their male counterparts (Cofrancesco et al., 2007).

Identifying risk factors associated with the physical health of stimulant users is an important public health issue. Advances in treatments need to address all health concerns, not only the stimulant use disorder. While some studies have examined physical comorbidities associated with stimulant use (de la Cruz et al., 2016), relatively little has been reported about the physical health characteristics, CRF and body composition of stimulant users. To achieve a more comprehensive treatment approach, a better understanding of the role of CRF and body composition is needed, along with how these characteristics are related to substance use and the psychosocial wellbeing of stimulant using individuals. The primary purpose of this study was to provide objectively measured data in describing the CRF and body composition of a stimulant using population.

2. Materials and Methods

We examined cross-sectional data gathered at baseline from the STimulant Reduction Intervention using Dosed Exercise (STRIDE) study, a multisite randomized clinical trial that examined exercise as an adjunct to treatment as usual for individuals in residential treatment programs (RTPs). A detailed description of the STRIDE study can be found elsewhere (Trivedi et al., 2011). Briefly, individuals admitted to one of nine participating U.S. RTPs were recruited to the study. Potentially eligible participants were approached after intake to the RTP and asked to complete a brief pre-screening questionnaire. Individuals who met initial eligibility criteria were invited to complete a more comprehensive screening process that included medical screening and a series of baseline examinations prior to randomization to one of the study intervention arms. The study procedures and all materials were approved by the Institutional Review Boards at each site and informed consent was obtained from all participants.

2.1 Participants

Individuals eligible to participate in the STRIDE study were males or females, aged 18 to 65, who were admitted to a participating RTP with a length of stay of approximately 21-28 days and had passed the cardiovascular screening exam. Participants had self-reported stimulant drug use (cocaine, methamphetamine, amphetamine, or other stimulant, excluding caffeine and nicotine) within the 30 days prior to admission to the RTP and met DSM-IV-TR criteria for substance abuse or dependence for stimulants within the last 12 months. Individuals were excluded from the study if they had: a general medical condition(s) that contraindicated exercise, opiate dependence, psychosis, or other psychiatric issue(s) that posed a safety risk, pregnancy, or concomitant treatment with beta blockers or opioid replacement therapy. Individuals were also excluded from the study if they were currently engaging in significant physical activity, defined as three or more sessions per week of at least 20 minutes in duration.

2.2. Medical Screening Process

Medical screening was performed prior to the baseline assessments to ensure that participants were not at risk of exacerbating a previously diagnosed medical condition and were physically capable of beginning an exercise intervention. The medical screening process consisted of laboratory tests, a physical exam (where measures of height, weight, WC, resting heart rate, and resting blood pressure were taken), and a maximal exercise test. Maximal exercise testing was conducted at an off-site facility with a licensed technician present under the supervisor of a physician as specified under ACSM guidelines for exercise testing (*ACSM Guidelines for Exercise Testing and Prescription*, 2010). The primary goals of the maximal exercise test were to: rule out ischemic responses to exercise (with its implications of cardiovascular disease), and establish a maximal heart rate to be used as a part of the exercise intervention. Participants completed a modified Cornell protocol where the treadmill grade and/or speed was gradually increased each subsequent two minute stage. Rating of perceived exertion, using the Borg scale, and heart rate were assessed at the end of each 2-minute stage. Participant CRF levels were determined by total time on the treadmill. The testing protocol was terminated when the participant reached volitional exhaustion or if an abnormal ECG was observed. For medical screening purposes, successful completion of the test required participants to achieve a peak heart within two standard deviations of their age-predicted maximum.

At one site, all 30 participants who enrolled in the study additionally had their CRF values assessed through indirect calorimetry during the maximal exercise test. During these tests, ventilatory gases were sampled and recorded every 15 seconds by a Care Fusion/Sensormedics V-Max Encore Metabolic Cart (San Diego, CA). Given the objectives of the maximal exercise test, traditional criteria for achieving a VO_{2max} , namely, a plateau in oxygen uptake with continued increases in workload, a plateau in heart rate with continued increases in workload, or an RPE = or > 18, were not strictly adhered to; therefore, we these values are referred to as their VO_{2peak} .

2.3 Assessments

At the baseline screening, which took place after the medical screening, demographic information was collected from all participants. DSM-IV-TR alcohol and substance abuse and dependence was assessed with the substance use modules of the World Health Organization *Composite International Diagnostic Interview (CIDI; Version 2.1)*. Additional DSM-IV Axis I diagnostic information was obtained using the *MINI International Neuropsychiatric Interview (MINI)*. Other study assessments that were conducted, either at the medical screening or baseline assessment, include: a *Timeline Follow Back (TLFB)* to gather the quantity of days, within the 30 day block prior to RTP admission, that participants had used stimulant drugs and other illicit substances, alcohol, or tobacco products; the *Addiction Severity Index-Lite (ASI-Lite)* to assess seven domains of issues associated with addiction; the *Self-administered Comorbidity Questionnaire (SCQ)* to assess existing medical problems and if they were severe enough to limit function in day to day life; the *Fagerström Test for Nicotine Dependence (FTND)*, administered only to individuals with confirmed tobacco addiction, to assess nicotine dependence; the *Quick Inventory of Depressive Symptomatology – Clinician-rated version (QIDS-C₁₀)* to assess for mood and

functional measurements, and to analyze the severity of depression symptoms; the *Cognitive and Physical Functioning Questionnaire (CPFQ)* to assess physical well-being and cognitive dysfunction; the *Short Form Health Survey (SF-36)* to assess quality of life (QOL) and general health separated into mental (MCS) and physical (PCS) composite scores; and the *Quality of Life, Employment and Satisfaction Questionnaire Short Form (Q-LES-Q-SF)* to assess general QOL and satisfaction in daily living.

2.4 Data Analysis

Descriptive characteristics of the sample were calculated using frequency or univariate procedures, along the standard deviation as the measure of variance, when applicable. Gender differences were assessed via chi-square tests to compare proportions of categorical variables, and t-tests to compare continuous variables. A sub-analysis was conducted on the 30 participants who underwent VO_{2peak} testing. Pearson correlations were calculated and reported in the overall sample and by gender comparing VO_{2peak} values to time on treadmill values for this subpopulation.

Three sets of regression procedures were completed based on the following three predictors: 1) CRF, 2) BMI, and 3) WC, for the entire sample, as well as by gender. Individual linear regression models were fit with each substance use and mental health measure as an outcome. Model 1 was adjusted for age, income level, race, education level, and study site. The linear regression procedures that included CRF as the predictor were further adjusted for BMI. The linear regression procedures that included either BMI or WC as the predictor were further adjusted for time on treadmill. Regression coefficients (β) were reported with corresponding p-values with an alpha set to 0.05. All analyses were conducted using Statistical Analytic Software (SAS) version 9.3 (SAS Institute, Inc., Cary, North Carolina).

3. Results

Four hundred and ninety seven individuals were screened for inclusion in the STRIDE study. A total of 302 individuals (males: $n=181$; females: $n=121$) were enrolled and randomized. The primary reasons for exclusion included: medical exclusions ($n=41$), current suicide risk or psychotic disorder ($n=35$), no abuse/dependence diagnosis ($n=20$), opiate dependence ($n=10$), use of excluded medications ($n=7$), significant activity levels at baseline ($n=4$), and life circumstances as determined by the site investigator that made participation unfeasible ($n=50$). Participants with missing assessments ($n=7$) were excluded from this analysis leaving a total sample of 295 participants ($n=176$ men, $n=119$ women).

Table 1 presents a detailed demographic breakdown of the sample. The average age was 38.7 (± 10.7) years and 70.2% of all participants were unemployed. The mean number of self-reported days of use in the 30 days prior to baseline for alcohol and stimulants was 8.2 (± 9.5) and 13.2 (± 9.1), respectively. The primary stimulants used by participants in this study were cocaine (79.1%), methamphetamines (26.8%), and amphetamines (1.3%). Other variables that differed significantly between genders included education (males: 12.6 ± 1.7 years, females: 12.2 ± 2.1 years; $p=0.02$), nicotine dependence (males: 3.8 ± 2.3 , females: 3.0 ± 1.8 years $p=0.04$), and the ASI-alcohol subscale score (males: 0.26 ± 0.3 , females: 0.14 ± 0.2 ; $p=0.002$). More detailed information on drug use characteristics of the

participants, as well as number of years of stimulant use, have been published previously (de la Cruz et al., 2014; Warden et al., 2016). No significant differences were found between cocaine versus methamphetamine/amphetamine users across education or income. However, cocaine users tended to be older (41.3 vs. 32.9 years; $p<0.0001$), male (64.4% vs. 47.1%; $p=0.006$), and white (68.6% vs. 18.8%; $p<0.0001$).

Table 2 displays the CRF levels (time on treadmill) of the study sample, as well as the subset of 30 individuals that performed their maximal exercise tests with indirect calorimetry (VO_{2peak} values). The overall study sample averaged 13.7 (± 2.9) minutes on the treadmill. Significant differences were observed by gender (men: 14.1 ± 2.9 ; women: 13.2 ± 2.8 minutes; $p<0.005$). Among the sub-group of 30 participants (men: $n=13$; women: $n=17$) that had their respiratory gases analyzed during the maximal exercise test, the mean time on the treadmill was 13.5 minutes (± 3.0) with corresponding VO_{2peak} values of 34.1 $mL \cdot kg^{-1} \cdot min^{-1}$ (± 7.7). Men (38.43 ± 7.43 $mL \cdot kg^{-1} \cdot min^{-1}$) had a significantly higher mean VO_{2peak} than women (30.8 ± 6.3 $mL \cdot kg^{-1} \cdot min^{-1}$; $p<0.005$). For this subset of 30 individuals, their time on treadmill was not significantly different than the larger sample ($p=0.52$). Their time on treadmill was significantly correlated with VO_{2peak} values ($r=0.83$; $p<0.0001$) with similar, significant correlations observed by gender (men: $r=0.90$, $p<0.0001$; women: $r=0.070$, $p=0.0016$). There were no significant differences in the CRF levels of cocaine versus methamphetamine/amphetamine users (13.5 ± 3.0 vs. 14.2 ± 2.6 minutes; $p=0.09$).

Table 3 displays the bodyweight status and waist circumference levels of the study sample. Participants were considered overweight based on their mean BMI (27.8 ± 5.7 kg/m^2), which differed significantly by gender (males: 27.3 ± 4.8 kg/m^2 , females: 28.7 ± 16.2 kg/m^2 ; $p=0.001$). Overall, 35.2% ($n=104$) of the participants were overweight and 31.2% ($n=92$) were obese. The mean WC for all participants was 93.5 cm (± 14.2), which differed significantly by gender (males: 93.7 ± 12.7 cm, females: 93.1 ± 16.2 cm; $p=0.004$). There were no significant differences in the BMI (28.0 ± 5.5 vs. 27.5 ± 6.4 kg/m^2 ; $p=0.46$) or WC (94.1 ± 13.8 vs. 91.7 ± 15.1 cm; $p=0.18$) between cocaine and methamphetamine/amphetamine users.

When examining the relationships between CRF, BMI, and WC with substance use and mental health measures, a significant, positive association was observed between CRF and PCS ($\beta=0.43$; $p=0.003$), which remained significant after adjustment for BMI. Post-hoc analysis revealed that the PCS domains of physical functioning ($\beta=0.42$; $p=0.005$) and general health ($\beta=0.51$; $p=0.006$) were both significantly associated with CRF. No significant relationships were observed between BMI and any of the substance use or mental health measures. A significant positive relationship was observed between WC and SCQ score ($\beta=0.02$; $p=0.02$). WC was also negatively related to PCS ($\beta=-0.06$; $p=0.03$). After adjustment for CRF, only the relationship with SCQ remained significant ($\beta=0.02$; $p=0.04$). Post-hoc analysis revealed that the SCQ sub-scales of diabetes (AOR=1.10, 95%CI: 1.05-1.15) and high blood pressure (AOR=1.06, 95%CI: 1.03-1.09) were both significantly associated with WC. No gender interactions between CRF, BMI, and WC with substance use and mental health measures were observed.

4. Discussion

The purpose of this study was to provide objectively measured data on the CRF and body composition levels of a stimulant using population and examine possible relationships with substance use and mental health measures. Previous research in this population has typically focused on mental health issues (Whiteford et al., 2013), with less attention being given to their physical health status. Our results demonstrate that, in addition to dealing with multiple addiction and mental health issues, stimulant users may also be at an increased health risk due to reduced CRF and elevated BMI levels.

The CRF levels observed in this study (a mean of 13.7 ± 2.9 minutes on the treadmill) indicate that overall fitness is impaired in stimulant users. As a comparison, in a previous study that assessed patient CRF levels using a similar Cornell protocol, healthy adults averaged 15.0 ± 4.2 minutes on the treadmill, while individuals with coronary artery disease averaged only 11.5 ± 2.6 minutes (Tamesis et al., 1993). Given the high correlation observed between time on treadmill and VO_{2peak} values in our subset of participants who completed their maximal exercise test using indirect calorimetry, we believe that the use of time on treadmill provides a valid representation of CRF levels for our entire sample. While the VO_{2peak} values for the men ($38.4 \pm 7.4 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) and women ($30.8 \pm 6.3 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) in our subset of 30 individuals are higher than those (men = $30.6 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$; women = $23.2 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) from a younger sample of methamphetamine users (Dolezal et al., 2013), they are lower than substance using European adults (Flemmen & Wang, 2015). According to established reference values (*ACSM Guidelines for Exercise Testing and Prescription*, 2010), the CRF levels observed in this study equate to the 40th and 35th percentiles for men and women, respectively, presenting a potentially significant health risk. While these findings may also be linked with other confounding factors, such as poor attendance to health, concomitant use of other substances/cigarettes, other comorbidities (i.e. direct vs. indirect effects), greater consideration should be given to increase opportunities for physical activity and improving the CRF of clients in the RTP setting, particularly in light of the accumulating evidence supporting the benefit of exercise training as an adjunct to substance using treatment programs (Bardo & Compton, 2015),

Few significant associations between CRF levels and substance use or mental health measures were observed. Our analyses did reveal a significant, positive association between PCS and CRF levels. Given that the PCS is an aggregate of four health concepts that assess self-perception of physical ability, it is logical that participants with a higher level of CRF perceive themselves as being in better physical health (Bize, Johnson, & Plotnikoff, 2007). This relationship appears to be driven by the PCS scales of physical functioning and general health, both of which have been significantly associated with CRF in previous work (Kaminsky et al., 2013). While WC was significantly and inversely related to PCS, this relationship did not remain significant after controlling for CRF, suggesting the importance of CRF on one's actual and perceived physical health.

The average BMI of our sample (27.8 kg/m^2) is considered overweight by national standards (Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults - The evidence report. National Institutes of Health. 1998), but is similar to

levels observed in other stimulant using populations (Dolezal et al., 2013; Westover et al., 2015). Weight gain during the recovery period is considered by some to be a substantial obstacle in successful abstinence (Vanbuskirk & Potenza, 2010), as food may be used as a drug substitute (Cowan & Devine, 2008). However, individuals in our study had their body composition assessed immediately after intake to the RTP, indicating that their BMI levels had not yet been impacted by their recovery period. Elevated BMIs increase the risk of morbidity and mortality (Guh et al., 2009) and may prove to be particularly detrimental when combined with a decrease in walking efficiency (Flemmen & Wang, 2015) and functional ability (Henry, Minassian, & Perry, 2010) in individuals with substance use disorders. The average WCs observed for our sample would be considered a risk factor for women (93.1cm), but not for men (93.7cm) (NHLBI Obesity Education Initiative Expert Panel on the Identification, Evaluation, and Treatment of Obesity in Adults (US), 1998). The relationship between SCQ and WC, appears to be driven by the sub-scales of diabetes and high blood pressure. Given that WC is an indicator of internal fat deposits and is independently associated with diabetes and the metabolic syndrome (Biggs et al., 2010), as well as poor cardiovascular health (C. M. Lee, Huxley, Wildman, & Woodward, 2008), it is not surprising that WC was positively associated with self-reported comorbidity in our study sample

4.1 Strengths and Limitations

There are a number of strengths and limitations to this study. First, our analytic sample (n=295) represents the largest examination of CRF and body composition in individuals with any type of a substance use disorder. Additionally, we used an objective measure of CRF from a medically supervised, maximal exercise test that showed a high correlation with values obtained from indirect calorimetry in a subset of participants. A first limitation of this study is that the physical status of STRIDE participants may not be generalizable to entire stimulant using population due to the exclusion of a small proportion of individuals who did not receive medical clearance (8.3%), as well as those who were already engaging in significant levels of physical activity (0.8%). Those who were able to complete the graded exercise test as a part of their medical examination (n=27), but were excluded from the study, had significantly lower CRF levels than those enrolled in the study. This suggests that the CRF levels presented in this paper, already well below population norms, are likely even lower when considering all individuals with stimulant use disorders. A second limitation may be the lack of variability in a number of individual variables, particularly stimulant use. Despite recruiting clients in a residential treatment setting, drug use, as determined by the ASI drug subscale score, was nearly half that observed in previous studies with stimulant users (McPherson et al., 2016). Similarly, our population of stimulant users reported a relatively low number of physical illnesses or medical conditions (de la Cruz et al., 2016). These low levels of self-reported substance use and existing medical conditions may account for the lack of significant associations with CRF and body composition. A final limitation is that our sample consists of cocaine (n=232), methamphetamine (n=81), and amphetamine (n=4) users, suggesting that our results may not be entirely generalizable to either category of drug users independently.

5. Conclusion

Individuals with heavy substance use often report poorer levels of physical health (Struening & Padgett, 1990) and higher levels of chronic disease (Maynard et al., 2015). In this study, we observed reduced CRF and increased BMI levels in our population of stimulant users compared to population norms, placing them at an increased risk of mortality and future cardiovascular and metabolic disease. Given the lack of information regarding CRF and changes in body composition associated with stimulant use, it may be particularly beneficial to obtain a better understanding of these physical health implications. Individuals seeking treatment for stimulant use disorders may greatly benefit from comprehensive interventions that address their substance use, body composition, and physical health during the treatment program.

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Highlights

- Little is known about the physical health of stimulant users
- Cardiorespiratory fitness levels are below average in this population
- Stimulant users may also be considered overweight based on body mass index
- Improving fitness and body composition needs to be a part of treatment programs

Table 1
Baseline characteristics of STRIDE participants

Variables	Overall Sample (N=295)	Males (n=176)	Females (n=119)	P value*
Age, mean (SD)	38.7 (10.7)	41.0 (10.7)	35.6 (9.9)	.300
Race/Ethnicity, n (%)				0.0003
Non-Hispanic White	136 (46.1%)	74 (42.3%)	62 (52.1%)	
Non-Hispanic Black	122 (41.4%)	88 (50.3%)	34 (28.6%)	
Hispanic	31 (10.5%)	10 (5.7%)	21 (17.6%)	
Non-Hispanic Other	5 (1.7%)	3 (1.7%)	2 (1.7%)	
Income level, n (%)				.003
Unemployed	207 (70.2%)	111 (63.1%)	96 (80.7%)	
\$10,000	53 (18.0%)	38 (21.6%)	15 (12.6%)	
> \$10,000	35 (11.8%)	27 (28.3%)	8 (6.7%)	
Education (years), mean (SD)	12.4 (2.0)	12.6 (1.7)	12.2 (2.1)	.020
ASI-Alcohol Subscale Score, mean (SD)	0.21 (0.2)	0.26 (0.3)	0.14 (0.2)	.002
ASI-Drug Subscale Score, mean (SD)	0.16 (0.08)	0.16 (0.08)	0.17 (0.07)	.34
Alcohol use (days), mean (SD)	8.2 (9.5)	9.6 (10.0)	6.2 (8.5)	.05
Stimulant use (days), mean (SD)	13.2 (9.1)	12.7 (9.3)	13.8 (8.9)	.34
Current Tobacco use (cigarettes/day), mean (SD)	10.5 (6.2)	10.0 (6.3)	11.2 (5.9)	.41
FTND [^] , mean (SD)	3.5 (2.1)	3.8 (2.3)	3.0 (1.8)	.04
QIDS score, mean (SD)	5.4 (3.1)	5.1 (3.1)	5.8 (3.0)	.84
CPFQ score, mean (SD)	18.0 (6.3)	17.8 (6.0)	18.3 (6.7)	.55
SCQ score, mean (SD)	1.1 (1.9)	1.1 (1.9)	1.2 (1.8)	.34
SF-36 MCS, mean (SD)	42.5 (13.7)	42.7 (13.3)	41.6 (14.3)	.39
SF-36 PCS, mean (SD)	55.0 (7.2)	55.0 (7.1)	55.0 (7.5)	.49
Q-LES-Q-SF score, mean (SD)	68.4 (16.3)	67.7 (16.6)	69.5 (15.7)	.53

STRIDE: Stimulant Reduction Intervention using Dosed Exercise.

ASI: Addiction Severity Index; FTND: Fagerström Test for Nicotine Dependence; QIDS: Quick Inventory of Depressive Symptomatology; CPFQ: Cognitive and Physical Functioning Questionnaire; SCQ: Self-Administered Co-Morbidity Questionnaire; SF-36 MCS: Short-Form Health Survey 36 - Mental Composite Score; SF-36 PCS: Short-Form Health Survey - Physical Composite Score; Q-LES-Q-SF: Quality of Life Enjoyment and Satisfaction Questionnaire.

[^] = only 127 participants who reported as being current smokers were included in the analysis.

* P-value denotes significant difference between genders (p<.05).

Table 2
Baseline cardiorespiratory fitness levels of STRIDE participants

	N	Overall	Men	Women
Time on Treadmill – Entire Sample (minutes $\pm$ SD)	295	13.7 (2.9)	14.1 [^] (2.9)	13.2 (2.8)
Time on Treadmill – Subset (minutes $\pm$ SD)	30 [*]	13.5 (3.0)	14.7 [^] (2.5)	12.6 (2.1)
VO _{2peak} of Subset (mL•kg ⁻¹ •min ⁻¹ $\pm$ SD)	30	34.1 (7.7)	38.4 [^] (7.4)	30.8 (6.3)

STRIDE: Stimulant Reduction Intervention using Dosed Exercise.

[^] Significantly greater than women (p<.005)

^{*} The subset of 30 individuals consisted of 13 males and 17 females.

Table 3
Baseline bodyweight status and waist circumference of STRIDE participants

	Overall	Men	Women
Body Mass Index (kg/m ²), mean (SD)	27.8 (5.7)	27.3 (4.8)	28.7 [*] (6.8)
Body Mass Categorization, % (n)			
Normal Weight	33.6% (99)	34.7% (61)	31.9% (38)
Overweight	35.2% (104)	38.6% (68)	30.3% (36)
Obese	31.2% (92)	26.7% (47)	37.8% (45)
Waist circumference (cm), mean (SD)	93.5 (14.2)	93.7 (12.7)	93.1 (16.2)

STRIDE: Stimulant Reduction Intervention using Dosed Exercise.

[^] Significantly greater than women (p<.005)

^{*} Significantly greater than men (p<.001)