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Marijuana use is associated with inattention in men and sleep quality in women with Attention-Deficit/Hyperactivity Disorder: A preliminary study

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Abstract

The study examined the association between marijuana use, ADHD symptoms, and sleep quality in 56 men and 20 women with ADHD. Participants, ages 18-45, were assessed with the Assessment of Hyperactivity and Attention, drug use survey, and Pittsburgh Sleep Quality Index. Moderate to strong correlations were found between marijuana use and inattentive symptoms in men, and marijuana use and decreased sleep quality in women. Men and women with ADHD may use marijuana for different reasons.

Keywords

Gender; sleep; marijuana

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a frequent childhood disorder, characterized by inattention, impulsivity, and hyperactivity, that may continue into adulthood (American Psychiatric Association, 2000). Studies have shown that marijuana is often used by individuals with ADHD to medicate symptoms of inattention and hyperactivity (Biederman et al., 1995; Upadhyaya et al., 2008). However, marijuana use may negatively affect sleep latency, sleep duration, and sleep quality (Schierenbeck et al., 2008), which could worsen ADHD symptoms. More specifically, ADHD symptoms have been associated with increased sleep disturbances (Schredl et al., 2007; Bijlenga et al., 2011), decreased sleep duration (Gau et al., 2007), and sleep quality (Mahajan et al., 2010). Yet, there are also findings suggesting that hyperactivity is not associated with poor sleep (Voinescu et al., 2012). However, no study has examined the relationship between marijuana use, ADHD symptoms, and sleep quality in men and women with ADHD. The aim of the study was to close this knowledge gap by exploring gender differences in relation to marijuana use, ADHD symptoms, and sleep quality in individuals with ADHD. Based on previous studies, it was hypothesized that a greater frequency of marijuana use is associated with increased frequency of ADHD symptoms and decreased sleep quality.

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2. Method

2.1 Participants

Seventy-six adults (56 men, mean age $\pm$ SD = 26.11 ± 7.01 , and 20 women, mean age $\pm$ SD = 28.83 ± 8.95) with ADHD participated in a cross-sectional study correlating the use of marijuana to ADHD symptoms and sleep quality. Each participant was assessed according to DSM-IV criteria (American Psychiatric Association, 2000) by a licensed psychologist (J.-G.G.) using the Structural Clinical Interview for DSM Disorders (First et al., 2002) and the QUEST Method (Wigal et al., 2007), which is a semi-structured clinical interview designed to assess ADHD in adults. The study sample consisted of 24 men (31.6%) and 5 women (6.6%) with inattentive subtype, 7 men (9.2%) and 0 women (0.0%) with hyperactive/impulsive subtype, and 25 men (32.9%) and 15 women (19.7%) with a combined subtype. The study was carried out in accordance with the Review Board at the University of California, Irvine, and was consistent with Federal guidelines.

2.2 Measures

Current use of marijuana was assessed using a self-report questionnaire. More specifically, participants reported how often they used marijuana on an 8-point scale, i.e., never used, have used, but not within the last year, once a year, 6 times a year, once a month, once a week, 2 to 6 times a week, and every day.

Severity of ADHD symptoms was evaluated using the Assessment of Hyperactivity and Attention (AHA). The AHA, an 18-item subjective questionnaire, is based on the DSM-IV criteria and is used to measure both childhood and adult symptoms of ADHD. The AHA was used as a quantitative measure of ADHD symptomatology (Mehring et al., 2002).

Sleep quality, sleep disturbance, sleep duration, and sleep latency during the last month were measured once, at the clinical interview, using the Pittsburgh Sleep Quality Index (PSQI), a questionnaire often utilized for clinical research to measure sleep disturbance (Buysse et al., 1988). The PSQI, consisting of 19 self-assessment questions, identifies the poor sleepers from the good sleepers through its component scoring method. The questions are categorized into 7 components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The sum of these components, ranging from 0 to 21, is the global PSQI score, where a score greater than 7 indicates sleep dysfunction (Gellis & Lichstein, 2009). The subjective measures of the sub-scores and global PSQI score are valid over different reporting periods ($r = 0.87$) (Broderick et al., 2011) and correlate with other sleep quality measures ($r = 0.69$) (Smith & Wegener, 2003). In addition, the overall test-retest reliability ($r = 0.88$, $p = 0.000$) and homogeneity (Cronbach's $\alpha = 0.85$) are high (Backhaus et al., 2002).

2.3 Statistical Analyses

Pearson correlations were used to determine the association between marijuana use, ADHD symptoms in the AHA, and PSQI scores. Correlations between marijuana use and ADHD symptoms were tested two-tailed at a p -value of 0.050. Moreover, a chi-square test was used to test the difference between men and women in regards to the frequency of marijuana use. To correct for multiple testing of the individual components of the PSQI (i.e., sleep duration, sleep disturbance, sleep latency, number of days of daytime dysfunction, sleep efficiency, overall sleep quality, sleep medications, and the global PSQI score), a modified False Discovery Rate by Benjamini and Yekutieli was used to adjust the alpha level to 0.015 (Narum, 2006). Mean differences between men and women in overall sleep quality and the individual components of the PSQI were tested two-tailed using a two-sample t -test at a p -

value of 0.050. In addition, a method proposed by Cohen and Cohen (1983) was used to test whether the correlations between marijuana use, ADHD symptoms, and poor sleep quality were significantly different between genders.

3. Results

Twenty-three (41.1%) out of 56 men and 6 (30.0%) out of 20 women used marijuana more than 6 times a year (Table 1), but this difference was not significant ($\chi^2 = 6.97, p = 0.432$). A significant correlation between marijuana use and the AHA score was found in men ($r = 0.27, p = 0.045$), but not in women ($r = 0.10, p = 0.672$). Specifically, the number of inattentive symptoms in the AHA was significantly correlated with marijuana use in men ($r = 0.30, p = 0.025$), but not in women ($r = 0.10, p = 0.671$). However, the correlation coefficients were not significantly different between men and women ($z = 0.75, p = 0.455$). In addition, no significant correlation was found between marijuana and hyperactive/impulsive symptoms ($r = 0.16, p = 0.248$).

Findings also showed that 41 (53.9%) out of 76 participants had a global PSQI score of greater than 7. The men had a mean score of 7.14 (SD = 3.43, range = 18) and the women had a mean score of 7.50 (SD = 3.17, range = 11). Twenty-nine men (52.9%) and 12 women (60.0%) showed scores greater than 7, suggesting that the majority of the participants had moderate to severe sleep disturbances. A significant correlation between marijuana use and sleep quality was found in women, whereas men did not show such association (see Table 2). The correlation coefficient in men was significantly different from the correlation coefficient in women ($z = 2.86, p = 0.004$). In addition, a strong association was found between marijuana use and poor sleep quality in women who used marijuana more than 6 times a year ($r = 0.62, p = 0.004$). There were no significant mean differences between men and women in overall sleep quality except in daytime dysfunction (means $\pm$ SD = 1.25 ± 0.96 , range = 3 and 1.84 ± 0.77 , range = 3 for men and women, respectively; $t(73) = 2.44, p = 0.017$).

4. Discussion

A significant correlation between greater frequency of marijuana use and increased number of inattentive symptoms was found in men, but not in women with ADHD. Although men with ADHD showed a stronger correlation than women, the correlation coefficients were not significantly different between genders. Previous research suggested that individuals with ADHD may use marijuana to treat their symptoms (Biederman et al., 1995; Upadhyaya et al., 2008) and our findings may support this hypothesis in men. Alternatively, increased marijuana use may negatively affect inattention in men, and to a lesser degree in women with ADHD. Clearly, more research is necessary to examine the causal effects of marijuana on ADHD symptoms.

In contrast, a significant correlation between marijuana use and decreased sleep quality in the PSQI was found in women, but not in men with ADHD. In addition, the correlation coefficients between men and women were significantly different from each other. Gender differences in regards to marijuana use, ADHD symptoms, and sleep quality may stem from differences in metabolism (Festa et al., 2004) and hormonal interaction with the drug (Craft et al., 2012). Women may become addicted faster than men because of differences in drug metabolism (Festa et al., 2004) and hormonal interaction with drugs (Craft et al., 2012). Alternatively, women may be more likely than men to have a decreased sleep quality subscore in the PSQI and increased drug's side effects (Brady et al., 1993). The results from the present study support findings from previous research in the general population showing that increased marijuana use is associated with poor sleep quality (Schierenbeck et al., 2008).

This suggests that women with ADHD may use marijuana as a means to self-medicate poor sleep quality. In addition, the greater quantity of the combined subtype in women may be associated with their decreased sleep quality. However, the frequency of marijuana use was less in women compared to men with ADHD, and the association in women does not establish causality. More specifically, it is unclear if women use marijuana to improve sleep quality, whether marijuana use leads to decreased sleep quality, or if women are not using enough marijuana to get the effect required for better sleep.

Other study limitations include the small sample size, unequal numbers of men and women, small number of women with Cannabis Use Disorder, and the lack of detail (dosage and timing of consumption) in the drug use survey. The lack of biomarkers may have also skewed our findings in that the effects of marijuana use on sleep may have been post-intoxication effects rather than long-term sequelae. Moreover, the differences in the biological processes and hormone levels of men and women, independently, could have contributed to our findings.

Despite these limitations, our findings suggest possible gender differences in the association between marijuana use, ADHD symptoms, and sleep quality. Men and women may be using marijuana for different reasons, which include an attempt to self-medicate ADHD symptoms (Biederman et al., 1995; Upadhyaya et al., 2008) and decreased sleep quality, respectively. As a consequence, such usage may also lead to increased inattention and decreased sleep quality. Thus, a greater understanding and further research of the association of marijuana use with ADHD symptoms and decreased sleep quality is needed and may aid in the development of interventions for marijuana use.

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Table 1Frequency of marijuana use in men ($N=56$) and women ($N=20$) with ADHD

Frequency of Marijuana Use	Men	Women
6 times/ year	5 (8.90%)	1 (5.00%)
Once a month	3 (5.40%)	3 (15.00%)
Once a week	6 (10.70%)	2 (10.00%)
2 to 6 times a week	7 (12.50%)	0 (0.00%)
Everyday	2 (3.60%)	0 (0.00%)
Total	23 (41.10%)	6 (30.00%)

Table 2

Correlations between the sleep quality with marijuana use in men ($N=56$) and women ($N=20$) with ADHD.

PSQI Components	Marijuana Use			
	Men		Women	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Decreased Sleep Quality	−0.013	0.926	0.583	0.007
Sleep Latency	−0.002	0.991	0.367	0.111
Sleep Duration	−0.033	0.814	0.073	0.759
Habitual Sleep Efficiency	−0.149	0.273	−0.195	0.409
Sleep Disturbances	0.176	0.195	−0.012	0.960
Sleep Medications	0.057	0.677	0.152	0.522
Daytime Dysfunction	−0.168	0.215	0.268	0.253
Global PSQI Score	−0.076	0.577	0.362	0.117