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Does Methylphenidate (Ritalin) have the potential to become a drug of abuse?

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Methylphenidate (MPD) known as Ritalin is a psycho stimulant with pharmacological characteristics similar to those of amphetamine (Amp) and cocaine that are known as drugs that cause dependency and are abused. MPD is used mainly in children and young adults to treat behavioral disorders such as ADHD. MPD use and abuse has recently increased dramatically by ordinary children and young adults as cognitive enhancement to improve academic performance in schools, universities and the work place. The objective of this study is to test whether MPD can elicit behavioral tolerance, sensitization, and withdrawal or cross sensitization with amphetamine a drug known to be addictive. Behavioral tolerance, sensitization, withdrawal and cross sensitization with addictive drugs are experimental tools indicating that the drug elicits symptoms that associate with physical dependence and are used as a biomarker to indicate that the drug elicits dependence that lead to substance abuse disorder (SUD). Twenty groups of young adult animals each N=12 were used 4 for Amp for control and 16 for MPD and Amp. Normal rats (Wistar Kyoto-WKY) and ADHD rat's model (spontaneous hyperactive rats-SHR) male and female were used. Upon arrival each rat was placed in their home cages that were used also as test cages for 5-7 days of adaptation to the new environment. Behavioral recording using the open field assay was used for 12 consecutive days as follows: Recording day 1 (RD-1) post saline injection to establish baseline. RD-2 to RD-7 animals was treated either with saline or with 0.6, 2.5, and 10.0 mg/kg MPD, or with 0.6 mg/kg Amp followed by three washout days (RD-8 to RD-10) and at RD-11 animals were treated similar to RD-2. At RD 12 all animals expose to 0.6 mg/kg Amp. Saline injection did not alter the animals' behavior however MPD treatment elicited in WKY rats dose response characteristics of increase in locomotor behavior, as well as, eliciting behavioral withdrawal and sensitization as well as cross sensitization with Amp. Female rats were more sensitive to the drug as compared to male. However, the SHR failed to exhibit tolerance, withdrawal and sensitization or cross sensitization with Amp. The observation obtained indicated MPD exposure to WKY i.e., normal animals elicits symptoms of SUD, while MPD exposure to ADHD rats (SHR) failed to elicit symptoms of SUD.