

## Misuse of Prescription Drugs as Cognitive Enhancement among Iranian University Students: Evidence from an Empirical Investigation

Habeeb Abdulrauf Salihu<sup>1\*</sup>, Monsurat Isiaka<sup>2</sup>, Kayode Abdullahi Ibrahim<sup>3</sup>, and Obasanjo Solomon Balogun<sup>4</sup>

<sup>1, 2, 3, 4</sup> Department of Criminology and Security Studies, University of Ilorin, Ilorin, Nigeria  
\*Email: salihu.ha@yahoo.com

\*Corresponding author

Received 30 September 2019 / Revised 16 November 2019 / Accepted in final form 18 November 2019 /  
Publish Online 25 December 2019

---

### Abstract

Medications prescribed for the treatment of neurological disorders are also used for stimulating alertness and concentration, increasing working memory and improving cognitive performance in healthy individuals. This study examines the misuse of such drugs as cognitive enhancement among Iranian university students; both primary and secondary sources of data were employed. A sample of 1,800 (graduate and undergraduate) students selected from 5 faculties in Allameh Tabataba'i University Tehran completed the questionnaires that included the demographic information and questions related to the research objectives. The findings indicated that the misuse of prescription stimulant drugs is widespread among students and that the need for success (to improved cognitive performance and boost academic grades) predicts the widespread. Thus, the study suggests that adequate public concern and sensitization that will internalize the negative effects of the drugs would be the appropriate intervention that may reduce the demand and misuse of prescription medications among the students.

**Keywords:** *Illicit drugs among Iranians, cognitive enhancement drugs, misuse of prescription drugs in Iran, enhancing learning capability through drugs, boosting academic grades, widespread use of psychoactive drugs among Iranian adolescents.*

---

### 1. Introduction

Islamic Republic of Iran is one of the countries around the world (most especially in the Middle-East) with a long history of illicit use of drugs (such as opium, cannabis, hookah, and diazepam and so on) (Ghiabi, 2015). Also, Iran is one of the countries recognised as having strict laws against the trafficking, possession and use of drugs (UNODC, 2008). Nonetheless, drug trafficking and addiction are among the major challenges the Iranian society is facing today. Addiction to opium and other psychoactive drugs is widespread among all social classes, ages, sexes and occupational groups in the country (Sabatelle, 2011). The country also accounts for over 70% of opium seizure globally and it is recognised as the central distribution of some psychoactive drugs to other parts of the world (Ghiabi, 2015; UNODC, 2008).

The pervasive level of drug addiction within the Iranian society has turned many adolescents into drug enthusiasts (Ahmad, Farzad, Mehdi, Mohammad, & Abbas, 2014). Although there is no official figure that discloses the prevalence of, and the rate at which adolescents (and adults) use psychoactive drugs in Iran; however, academic researchers continue to fill in the gap. For instance, a study conducted in Shiraz (one of the urban centres in Iran), reported that 30.23% of young Iranians surveyed used psychoactive drugs for recreational purpose at least once and 23.86% were addicted to psychoactive substances such as heroin, morphine, hashish, and cannabis (Ahmadi & Hasani, 2003). Moreover, the Iran Drug Control Headquarters reported that the misuse of psychoactive drugs is the bane of the young generations in the country. Adolescents are not only addicted to (psychoactive) drugs, drug dealings (smuggling and selling) have also completely become a source of income for many (Iran Drug Control Headquarters [IDCH], 2007).

Goodarzi et al. (2011) and Mirzendehtdel et al. (2010) reported that although drug addiction is endemic among Iranians; the upsurge in the level of abuse of psychoactive drugs among young Iranians (between the ages of 8 and 25 year-old) in recent years is exceptional. Researchers have identified several factors responsible for this upsurge. These factors include poor collective or societal attitude against misuse

of drugs; lack of will to eradicate the spread, rehabilitation of addicts and prosecution of traffickers on the part of the government; unemployment and economic situations; lack of adequate emotional support by relatives, and peer pressure among others (Ahmad et al., 2014; Ghiabi, 2015; Sabatelle, 2011). Mirzendehtel et al. (2010) noted that many Iranian adolescents usually smoke, sniff, or inject psychoactive drugs to relax, relieve themselves from stress and boredom, and get their minds off sadness, gory incidents, and loneliness.

However, in recent years, there is a development that stirred the increase in the demand and motivated the widespread of the recreational use of prescription drugs among Iranian adolescents (students). Some of the prescription drugs as Ahmad et al. (2014) observed are not, mainly, used for the purposes of sedative and relieving stress, loneliness or depression, rather they are used as a motivational object (enhancer or stimulant) to improve learning (cognitive), get higher grades and have an edge over other students in the class. In addition, having revised a number of empirical research on drugs in Iran, it was observed that studies that examined this development are rare.

Majority of the previous (literature) studies have rather focused attention mainly on the prevalence of recreational use of certain types of addictive drugs (usually opium, heroin, cannabis, hookah, tobacco, and alcohol) among adolescents in high schools and universities; highlighted the problems associated and identified the likely factors that led them to the use of drugs; and provided measures for effective prevention and rehabilitation programs. However, Goreishi and Shajari (2013) observed in their study that there was an increase in the demand and misuse of prescription drugs such as Ritalin, Adderall, Modafinil, Pethidine, Morphine among Iranian adolescents but the reason or purpose for the increase was not addressed in the study. Also, Afshin, Mahasti, Ayoub, Leili, Mohammadali, and Kamyar (2011) and Ahmad et al. (2014) gauged the frequency of the use of Ritalin among Iranian medical students and assessed their knowledge of the negative effects of the drug. They observed a widespread misuse of stimulant drugs among the medical students and partially attributed the misuse to students' aspiration for success.

Furthermore, given that the previous studies in this line of research have attributed the increase in the demand for, and misuse of prescription drugs (such as cognitive enhancement medications), among healthy persons, to motivational needs such as the need to study for longer hours, to improve alertness and learning abilities in order to get higher grades and meet up with the required standards for scholarship awards and prizes at colleges and also the employers' prerequisites (Aikins, 2011; Franke et al., 2010; Soetens, Dhooze, & Hueting, 1993; Zeeuws & Soetens, 2007). This study, therefore, seeks to examine the misuse of prescription drugs among healthy Iranian adolescents (university students) as a motivational inducement to improve learning and obtaining higher grades.

## **2. Objectives**

The objectives of this study are to: (a) investigate the widespread misuse of prescription (cognitive) stimulant drugs among the students of Allameh Tabataba'i University Tehran, Iran; (b) identify the major method of obtaining the cognitive prescription medications; and (c) examine the effectiveness of the drugs on the learning ability and ability to improve grades among users in Allameh Tabataba'i University Tehran, Iran.

## **3. Conceptualizing Prescription drugs and Cognitive Enhancement**

Prescription drugs are pharmaceutical drugs that are legally recommended or given to individuals suffering from a particular ailment by an authorised medical practitioner (Holt & Treloar, 2008). The online Medical-Dictionary defined a prescription drug as an 'approved drug which must, by law or regulation, be dispensed only pursuant to a prescription' (Medical Dictionary, 2018). Generally, the availability and use of prescription drugs are usually regulated or controlled primarily for considerations of potential misuse and safety. However, there are different definitions of what constitutes a prescription drug. The meaning and composition depend largely on the laws or legal framework of each country (Schuster, 2006).

Like other drugs, prescription drugs are used for different reasons and purposes. The United States' National Institute on Drug Abuse (NIDA) reported that prescription drugs are the third most widely addictive category of drugs around the world. NIDA added that the three classes of prescription drugs people often use for non-medical purpose are: opioids used for the treatment of chronic pains; central nervous system (CNS) tranquilizers, such as psychoactive drugs used for the treatment of anxiety and sleep disorders, and stimulant

medications, such as Adderall, Concerta, Daytrana, Methylin and Ritalin, prescribed for people suffering from attention deficit disorder and narcolepsy (National Institute On Drug Abuse [NIDA], 2017).

Licit and illicit uses of prescription drugs have the potential to cause serious health injury, especially when used in a manner inconsistent with their instruction or when taken in a manner or dosage other than the prescribed and/or used by someone other than the patient to whom they were prescribed (Clark, Shamblen, Ringwalt, & Hanley, 2012). However, studies revealed that there are certain positive outcomes in using some prescription drugs in healthy individuals. For instance, many of the medications prescribed for the treatment of psychiatric and neurological disorders have also been found to be effective in improving cognitive performance (cognitive enhancement) in healthy persons (see the work of Sattler, Sauer, Mehlkop, & Graef, 2013 and Franke et al., 2010).

Cognitive Enhancement is one of the major reasons people, most especially students, use or get addicted to prescription drugs (Bostrom & Sandberg, 2009); that is, increasing learning self-esteem or improving the ability to compete with others in competitions (exam, interview etc.) through drugs. Cognitive is a process that includes such measures as 'acquiring information (perception), selecting (attention), representing (understanding) and retaining (memory) information, and using it to guide behaviour (reasoning and coordination of motor outputs)' (Bostrom & Sandberg, 2009). In other words, any manipulation (medical or psychological) aimed at improving or increasing the ability and capacity of any of these measures amounts to an enhancement. Thus, cognitive enhancement can simply be described as reinforcing the core capabilities of the mind through the manipulation of the internal or external information processing systems.

Medications such as Ritalin (methylphenidate) and Adderall are central nervous system stimulants mainly used for the management and treatment of a variety of disorders such as attention deficit hyperactivity disorder (ADHD) and long-term neurological disorder that affects the regulation of sleep-wake cycles (narcolepsy) (Daniali, Nahavandi, Madjd, Shahbazi, Niknazar, & Shahbazzadeh, 2013). The effects of these drugs are immense; they increase the activities and executive functions of the central nervous system in patients and even work more vigorously in healthy or normal people. They produce such effects as improving their abilities to focus attention, increase alertness, combat stress and fatigue, and efficiently improve working memory and enhance cognitive improvement in a normal healthy adult (Bostrom & Sandberg, 2009; Keane, 2008; Volkow & Swanson, 2008). Accordingly, these drugs are commonly used by some people as a cognitive enhancer to improve learning ability. A study carried out in the United States of America revealed that there is an abundant and misuse of prescription drugs among college students in most United States campuses. About 4 to 10% of the college students were reported to have used methylphenidate and Adderall as stimulant medications to enhance learning and improve alertness (Weyandt et al., 2016).

In addition, modafinil is used for the treatment of fatigue caused by disorder such as narcolepsy, sleep apnoea and shift-work sleep disorder, and often recommended for healthy people especially those who need to stay alert and awake (such as physicians and troops) for a special task; it is also effective for improving cognitive performance (Bostrom & Sandberg, 2009). A review of clinical studies on the effects of modafinil on cognitive performance carried out in 2015 revealed that there is a positive outcome that modafinil improves executive function, attention, learning, and memory. Although, some elements of decrease in certain cognitive functions are likely to set in overtime if overused (Battleday & Brem, 2015). Generally, the anticipated outcome of cognitive enhancement drugs (in patients and healthy individuals) is to manipulate cognitive performance relative to the actual state by increasing working memory performance, improving learning concentration and allowing longer or more hours of study or work (Kadison, 2005). A cognitively enhanced person is somebody who has benefited from an intervention that improves the performance of some cognitive subsystem without correcting some specific, identifiable pathology or dysfunction of that subsystem (Battleday & Brem, 2015).

Studies revealed that factors such as persistent low student grades (often below the average point), highly competitive standards or requirements set for college admission and scholarship are connected with higher rates of misuse of prescription drugs (McCabe, Knight, Teter, & Wechsler, 2005). Stimulant medications reported to be more popular among high-school and university students. They are often used by students when there is a need to stay awake through the night to study extra hours for exams or tests and/or complete academic projects (Weyandt et al., 2016). In a survey conducted on 115 college students using stimulant medications in the United States of America, the results showed that enhancing learning ability was

the primary reason why the majority of the students used stimulant medications (Rabiner et al., 2009). In another study, Kadison (2005) found that persistent students' aspiration to succeed academically, huge workloads, and the standards set by employers are the major factors that place students at an increased risk for the use of stimulants medications.

These assertions predict that the misuse of prescription (cognitive enhancement) drugs is an approach to accomplishing or achieving academic success. Although, cognitive enhancement drugs might also be used as a means of coping with stressors and increasing other subjective outcomes (Weyandt et al., 2016). Nonetheless, experts have identified the negative effects of these drugs in healthy individuals. Rabiner, Anastopoulos, Costello, Hoyle, McCabe, and Swartzweder (2009) observed that like every other psychoactive drug, misuse of prescription cognitive drugs may pose or have serious medical implications on the body systems (including brain damage). Other studies also disclosed that non-medical use of methylphenidate and other related medications may cause abdominal upset, nausea and impair the ability of certain aspects of cognition while enhancing others simultaneously. In addition, it may affect the most complex and important human organ and increases the risk of inadvertent side effects (Advokat, Guidry & Martino, 2008 ; Centers for Disease Control and Prevention, 2010; Weyandt et al., 2013)

Furthermore, the misuse of cognitive enhancement drugs by healthy individuals have been criticised by many people on the moral ground. Goodman (2010) stressed that using cognitive enhancement drugs by healthy individuals to manipulate or improve learning capability is unnatural, amounts to cheating, undermines the value of human effort and equals the unlawful use of drugs. Generally, the illicit use of drugs has negative outcomes for users. It has a chain of psychological and behavioural expressions and considered as a major brain disease that manipulates body organs (particularly the brain and muscles) and changes the structure as well as operation of the body system (Ghiabi, 2015). It can result in antisocial behaviour, psychological disorders and infectious diseases in users. In addition, it incites some social problems such as crime, stress, family and emotional instability, child abuse and other forms of violent behaviours (Ahmad et al., 2014; Sabatelle, 2011).

#### **4. Materials and Method**

This research adopts a quantitative descriptive design to identify and analyse issues relating to the research objectives. The study was purposively carried out on graduate and undergraduate students of Allameh Tabataba'i University Tehran, Iran. Allameh Tabataba'i University is an institution that specialises in humanities and social sciences in Iran. It is ranked first in the humanities and social sciences and among the top best universities in Iran (see the Iranian Ministry of Science and Education's Annual Institution Ranking). The position makes its admission a highly competitive one among candidates. The University has 12 faculties (including Graduate School) and 5 campuses (all located in Tehran). Dehkede Olympic is the Central Campus housing 5 major faculties (Law and Political Science, Communication Science, Management and Accounting, Psychology and Education, and School of Graduate Studies). This study focused on the students in all the 5 faculties in Dehkede Olympic Campus. The total number of students in each faculty is not known (no information is available or provided for the research), however, the total number of the students in the campus is around 5,500-6,000 as at the time this research is being conducted.

A letter of permission and assessment of the research contents (and instrument) was written to the Board of Ethics and Research of the University. Following the assessment, permission was granted (letter in the Persian Language) for the research to commence. In addition, the Research Ethics Committee supervised the processes of the study and reassessed the findings.

Stratified and simple random sampling was employed to draw a total of 1800 students (360 each) from the 5 faculties in the campus. Questionnaires were used as a framework for collecting data. The questionnaire was designed in Persian language, owing to the fact that Persian is the official language in Iran. It was administered to a total of 1,800 respondents with the assistance of 5 research assistants. In addition, the questionnaires were administered to students during the lunchtime break between 12:30 pm and 1:30 pm at the dining halls. The university provided lunch for the students, they gather in the dining hall for lunch. In order to ensure a reasonable level of validity and accuracy of the instrument, the questionnaire was evaluated by the Research Ethics Committee of the university. Also, a number of research experts in the university assessed the instrument. Modification was, therefore, made based on the comments and recommendations

provided by these experts. Also, a pilot study was conducted on 50 students across the faculties; this was done in order to identify and correct possible inaccuracies in the questionnaire. Moreover, in order to ensure a balance in the demographic profile of the samples a researcher was assigned to administer questionnaires to students from each faculty.

Participation in the study was voluntary. Participants' consents were sought and were informed of the objectives of the study. Confidentiality of the information and assurance of anonymity was given to them. This was ensured given that the researchers did not have access to personal details (such as name, student number, address, e-mail, phone number and academic records) of the participants. Therefore, all information collected was anonymous. The information gathered was then analysed using the Statistical Package for Social Sciences (SPSS) in generating simple percentage, frequency distributions, and correlation on some factor analyses of the responses relating to the research questions.

## 5. Results

**Table 1** Demographic distribution of respondents

Items		Frequency	Percentage (%)
Gender	Male	918	51
	Female	882	49
Total		1,800	100
Age	18-22 years	324	18
	23-27 years	713	40
	28-32 years	521	29
	33 years-above	242	13
Total		1,800	100
Educational Level (stage)	Bachelor Degree	846	47
	Master Degree	661	36.7
	Ph.D.	293	16.3
Total		1,800	100

**Source:** Field Survey, 2019

Table 1 presents the demographic distribution of the respondents. The results show that 51% of the respondents were male and 49% were female. In addition, 18% of the respondents were between the age of 18 and 22; 40% between 23 and 27; 29% between 28 and 32; and 13% between 33 and above. Also, 47% of the respondents were in bachelor degree, 36.7% were in master degree and 16.3% were in Ph. D. degree. The implications of these findings are that there is a slight male predominance in this study (51% vs 49%), the age range of the majority of the participants (male and female) were between 23 and 27 year-old and the majority were in bachelor degree.

**Table 2** Distribution of respondents' perception of misuse and widespread of prescription drugs among the students

Items	Strongly Agree	Agree	Strongly Disagree	Disagree	I don't know	Total
Misuse of prescription drugs as cognitive enhancement is common or widespread among the students.	428 (24%)	738 (41%)	194 (11%)	362 (20%)	78 (4%)	1800 (100%)
Students also use prescription drugs for purposes other than cognitive enhancement.	136 (8%)	306 (17%)	432 (24%)	508 (28%)	418 (23%)	1800 (100%)

**Source:** Field Survey, 2019

Table 2 presents the perception of respondents on the widespread misuse of prescription drugs as cognitive enhancement. It showed that 24% and 41% of the respondents strongly agree and agree respectively that the misuse of prescription drugs as cognitive enhancement is widespread and common among the students; while 11% strongly disagree and 20% disagree, 4% reported that they do not know. The findings indicated that the majority of the respondents were of the perception that the misuse of prescription drugs as cognitive enhancement is widespread among the students. In addition, 8% and 17% of the respondents strongly agree and agree respectively that students also use prescription drugs for purposes other than cognitive enhancement, 24% and 28% of the respondent strongly disagree and disagree respectively and 23% of the respondents were of the view that they do not know. The findings imply that the majority of the respondents were of the perception that students do not use prescription drugs for purposes other than cognitive enhancement.

**Table 3** Distribution of respondents’ response on if they have either used or are currently using prescription drugs as a cognitive enhancement

Items	Frequency	Percentage (%)
Yes	1,026	57
No	691	38.4
I don’t know	83	4.6
Total	1,800	100

**Note:** In order to be able to get relevant information on how students obtain the drugs and how effective the drugs are, this study only analysed the responses of those that have either used or are currently using the drugs among the respondents. Therefore, the remaining results and analysis focussed on 1026 participants that ticked ‘Yes’ based on the results in table 3.

**Source:** Field Survey, 2019

Table 3 shows that 57% of the respondents reported that they have either used or are currently using prescription drugs as cognitive enhancement to improve learning capability; while 38.4% of the respondents responded in the negative, 4.6% reported that they do not know. The findings imply that majority of the respondents in this study have either used or are currently using prescription drugs as a cognitive enhancement to improve learning capability and boost academic grades.

**Table 4** Distribution of respondents’ responses on methods of obtaining the prescriptive medications

Items	Frequency	Percentage (%)
Presenting wrong symptoms to health professionals	17	1.7
Altering or forging prescriptions	33	3.2
Purchase from the street or unlicensed sellers	360	35.1
Purchase from friends and peers (who are patients of attention disorder)	472	46
Theft from parents or other relatives	144	14
Total	1,026	100

**Source:** Field Survey, 2019

Table 4 presents the responses of the respondents that have either used and/or are currently using prescription drugs based on the information in table 3. The table shows that 1.7% of the respondents were of the view that they present wrong symptoms to health professionals (such as a doctor) to get the drugs; 3.2% alter or forge prescriptions, 35.1% purchase from the street or unlicensed stores, 46% purchase from friends and peers using the drugs to treat attention disorder; while 14% often steal it from their parents or other relatives using the drugs to treat a disorder such as neurotic and other related ailments. The findings indicated that the majority of the respondents that have used or are currently using prescription drugs as cognitive enhancement get or purchase the drugs from friends and peers using the drugs to treat attention disorder.

**Table 5** Distribution of respondents' responses on whether prescription drugs enhance learning capability and improve grades

Item	Strongly Agree	Agree	Neither agree nor disagree	Strongly Disagree	Disagree	Total
Prescription drugs improve learning capability (cognition).	236 (23%)	401 (39%)	215 (21%)	41 (4%)	133 (13%)	1,026 (100%)
Item	Very Good	Good	Moderate/Average	Very Bad	Bad	Total
Performance/grade evaluation when prescription drugs are used.	215 (21%)	349 (34%)	287 (28%)	31 (3%)	144 (14%)	1,026 (100%)

**Source:** Field Survey, 2019

Table 5 presents prescription drugs users' perception of the drugs. It can be observed that 23% and 39% of the respondents strongly agree and agree respectively that prescription drugs improve learning ability, 21% neither agree nor disagree, 4% and 13% strongly disagree and disagree respectively, while 4% reported that they do not know. The findings indicated that the majority of the respondents were of the opinions that the prescription drugs improve learning capability in users. In addition, the table shows that 21% and 34% of the respondents held the perception that prescription drugs improved their academic performance and grades, 28% held that their performance was average, while 3% and 14% were of the perception that their performance was very bad and bad respectively. The implication of this is that the majority of the respondents were of the view that prescription drugs improve their academic grades.

**Table 6** Distribution of respondents (prescription drugs users) under the university scholarship and other students' benefits.

Item	First category	Second category	Third category	None	Total
Respondents (prescription drug users) on the university scholarship program.	133 (13%)	380 (37%)	431 (42%)	82 (8%)	1,026 (100%)
Respondents (prescription drug users) on the university monthly stipends benefit.	195 (19%)	267 (26%)	328 (32%)	236 (23%)	1,026 (100%)

**Source:** Field Survey, 2019

Table 6 presents respondents' responses to the category of scholarship and students' benefit they enjoy due to their academic performance. It can be observed that 13% of the respondents were on the first category of the university scholarship, 37% were on the second, 42% were on the third category, while 8% were not on any scholarship benefit. In addition, 19% enjoy the first category of the university monthly stipends, 26% were on the second category and 32% on the third category, while 23% are not qualified for the university stipends. The implication of these results is that the majority of the students that use prescription drugs as cognitive enhancement were on the university scholarship and stipends benefits.

**Table 7** Correlation analysis between respondents' perception of prescription drugs and academic performance (improved learning and grades).

Variables	Mean	SD	Significant Level	Correlation Coefficient (r-value)	p-value
Prescription Drugs as Cognitive Enhancement	4.6441	0.70898	0.01	0.943	0.000
Improve in learning capability and Grades	4.4338	0.80402			

**Source:** Field Survey, 2019

Table 7 shows the correlation coefficient between respondents' opinion of prescription drugs as cognitive enhancement and improved learning capability and academic grades. The calculated r-value 0.943 > 0.5, and the p-value 0.000 < the level of significance 0.01 ( $p < 0.01$ ). Therefore, there is a significant positive correlation between respondents' use of prescription drugs as cognitive enhancement and improved learning capability and academic grades.

## 6. Discussion

It is important to reiterate the objectives of this study at the beginning of this section. The study aimed at investigating the widespread misuse of prescription medications among the students of Allameh Tabataba'i University Tehran as cognitive enhancement, identify the major methods of obtaining the medications and examine how effective or efficient the prescription drugs have improved capacity for learning and grades among them.

The findings revealed that misuse of prescription drugs as cognitive enhancements to improve learning abilities and academic grades were widespread among the students of (Dehkede Olympic campus) Allameh Tabataba'i University; that many of the students do not use prescription drugs for purposes other than cognitive enhancement; that the primary source of obtaining cognitive enhancement prescription drugs by students was through direct purchase from friends and peers using the drugs to treat attention disorder (and from unlicensed or street sellers); and that a positive relationship between students' observed outcome in the use of cognitive enhancement prescription drugs and improved learning ability and academic grades was established.

Basically, the findings indicated that prescription drugs are commonly used by the majority of the (respondents) students purposely to improve academic capability. Given that Allameh University is one of the top universities in Iran, the academic standard set for students is very high. For instance, the minimum grade required to cross to another level of study (good-standing), say from the first-year to second-year, for bachelor students is above average (15 out of 20 points) compared with other institutions. Also, students are required to obtain a certain score (usually between 17.5 and 19 points) for them to get, upgrade and/or maintain their scholarship opportunities in the university. Besides, students with high-grades are entitled to monthly stipends and other benefits (see the University prospectus and scholarship policy). Thus, the need to meet up with these standards appears to be a motivating factor that impelled some students to use enhancement stimulants to improve their cognitive capability and perform well in exams.

Additionally, the percentage of the respondents who had either used or are currently using enhancement stimulants are enjoying the university's scholarship and other students benefit programs based on their performance and the correlation analysis indicated that enhancement stimulants were effective. Therefore, these findings corroborate the results of Advokat et al. (2008), Soetens, Casaer, and Hueting (1995), Zeeuws and Soetens (2007) where they found that prescription stimulants medications improve learning performance in healthy individuals. From the foregoing, it can, therefore, be inferred that students' observed positive outcomes of the cognitive prescription stimulants encourage the use of the medications.

## 7. Conclusion and recommendation

From the review of the literature, it was recognised that medications prescribed for the treatment of psychiatric and neurological disorders are also effective for stimulating alertness and concentration, increasing working memory and improving cognitive performance (cognitive enhancement) in healthy individuals. The findings of this study also indicate a positive correlation between the perceived favourable outcome of the medications and improved learning and academic grades. This study, therefore, concludes that the need for success predicts the widespread misuse of cognitive stimulants among the students of Allameh Tabataba'i University Tehran, Iran.

However, there is a need for public enlightenment and sensitization on the negative outcomes and damages these drugs could cause. Although the efforts of the authorities and stakeholders in Iran are commendable in fighting against drugs such as opium and heroin, adequate attention should also be given to the misuse of prescription drugs among healthy adolescents. Given that prescription drugs, as studies revealed, are the third most illicitly used and addictive drugs among adolescents across the globe, a special community-based-approach aimed at internalizing the potential risks of these drugs (in healthy persons) and the value of human effort should be designed and incorporated into the existing anti-drug programmes in Iran. This will be a long way in educating people and reducing the demand and misuse of the drugs. As Sattler et al. (2013) observed in their study on cognitive enhancement drugs among university students and teachers in Germany, stronger internalization of the risks and danger associated with misuse of cognitive-enhancing drugs led students to refrain from the demand and use of the medications.

In addition, efforts on the sale and distribution control of cognitive (and other addictive) prescription drugs should be intensified in the country. The authority should extend the crackdown on drug traffickers to illegal and unlicensed drug stores and sellers. Also, any patients of disorder suspected or caught practising medication diversion or selling their prescriptions to non-patients should not be allowed to buy or possess more than the daily prescribed dosage or should be mandated to visit the nearest pharmacist store to take the medication daily. In addition, a threat of punishment in term of warning to restrain the sale of the medications to any patient that transfers or sells the pills to anyone may likely make them adjust.

## 8. Scope and Limitations

This study investigates the use of prescription drugs as cognitive enhancement among the students of Allameh Tabataba'i University. The study is devoid of certain limitations which may question the reliability and validity of the findings. It only considered one university in Tehran (with a sample of 1,800), the capital city of Iran. In addition, the sample size may not be a representative of the population of the students in the university and there may be some variation in the perceptions of other students (even in other campuses). Also, the study did not compare the perceptions of students in the different (departments) academic field. Moreover, the perceptions of the students were self-reported, the authors do not have access to their academic grades to confirm if the drugs actually improve their academic performances. Additionally, this study did not compare the academic performance of students using enhancement stimulant with those that do not use it; and no consideration was given to a particular cognitive enhancement drug or the type widely used among these students. In the light of these issues, the findings of this study are expected to incite criticism and further research in this line of study.

## 9. References

- Advokat, C., Guidry, D., & Martino, L. (2008). Licit and Illicit Use of Medications for Attention-Deficit Hyperactivity Disorder in Undergraduate College Students. *Journal of American College Health*, 56(6), 601–606.
- Afshin, H., Mahasti, A., Ayoub, M., Leili M., Mohammadali, M., & Kamyar, G. (2011). Illicit Methylphenidate Use Among Iranian Medical Students: Prevalence and Knowledge. *Drug Design, Development and Therapy*, 5(1), 71–76.
- Ahmad, A. E., Farzad, J. M., Mehdi, M. A., Mohammad, M. A. A., & Abbas, A. (2014). Intention and Willingness in Understanding Ritalin Misuse Among Iranian Medical College Students: A Cross-Sectional Study. *Global Journal of Health Science*, 6(6), 43–53.

- Ahmadi, J., Hasani, M. (2003). Prevalence of Substance Use Among Iranian High School Students. *Addict Behaviour*, 28(2), 375–379.
- Aikins, R. D. (2011). Academic Performance Enhancement: A Qualitative Study of the Perceptions and Habits of Prescription Stimulant–Using College Students. *Journal of College Student Development*, 52(2), 560–576.
- Battleday, R. M., Brem, A. K. (2015). Modafinil For Cognitive Neuroenhancement in Healthy Non-Sleep-Deprived Subjects: A Systematic Review. *European Neuropsychopharmacology*, 25(11), 1865–81. <https://doi.org/10.1016/j.euroneuro.2015.07.028>
- Bostrom, N., Sandberg, A. (2009). Cognitive Enhancement: Methods, Ethics, Regulatory Challenges. *Science and Engineering Ethics*, 15(1), 311–341.
- Centers for Disease Control and Prevention. (2010). Emergency Department Visits Involving Nonmedical Use of Selected Prescription Drugs–United States, 2004–2008. *Morbidity and Mortality Weekly Report*, 59(23), 705–709.
- Clark, H. K., Shamblen, S. R., Ringwalt, C. L., & Hanley, S. (2012). Predicting High Risk Adolescents' Substance Use Over Time: The Role of Parental Monitoring. *The Journal of Primary Prevention*, 33(2–3), 67–77. <https://doi.org/10.1007/s10935-012-0266-z>
- Daniali, S., Nahavandi, A., Madjid, Z., Shahbazi, A., Niknazar, S., & Shahbazzadeh, D. (2013). Chronic Ritalin administration during adulthood increases serotonin pool in rat medial frontal cortex. *Iranian Biomedical Journal*, 17(3), 134–139. <https://doi.org/10.6091/ibj.1173.2013>
- Franke, A. G., Bonertz, C., Christmann, M., Huss, M., Fellgiebel, A., Hildt, A., & Lieb, K. (2010). Non-Medical Use of Prescription Stimulants and Illicit Use of Stimulants For Cognitive Enhancement in Pupils and Students in Germany. *Pharmacopsychiatry*, 43(2), 1–7.
- Ghiabi, M. (2015). Drugs and revolution in Iran: Islamic devotion, revolutionary zeal and republican means. *Iranian Studies*, 48(2), 139–163. <https://doi.org/10.1080/00210862.2013.830877>
- Goodarzi, F., Karrari, P., Eizadi-Mood, N., Mehrpour, O., Misagh, R., Setude, S., & Amrollahi, M. (2011). Epidemiology of Drug Abuse (chronic intoxication) and its Related Factors in a MMT Clinic in Shiraz, Southern Iran. *Iranian Journal of Toxicology*, 4(4), 377–380.
- Goodman, R. (2010). Cognitive enhancement, Cheating, and Accomplishment. *Kennedy Institute of Ethics Journal*, 20(2), 145–160.
- Goreishi, A., Shajari, Z. (2013). Substance Abuse among Students of Zanjan's Universities (Iran): A Knot of Today's Society. *Addiction and Health*, 5(2), 66–72.
- Holt, M., & Treloar, C. (2008). Pleasure and drugs. *International Journal of Drug Policy*, 19(5), 349–352. <https://doi.org/10.1016/j.drugpo.2007.12.007>
- Iran Drug Control Headquarters (IDCH). (2007). *Rapid Situational Assessment*. Tehran. Retrieved from [http://dchq.ir/en/index.php?option=com\\_content&view=article&id=1160&Itemid=825](http://dchq.ir/en/index.php?option=com_content&view=article&id=1160&Itemid=825)
- Kadison, R. (2005). Getting An Edge – Use of Stimulants and Antidepressants in College. *New England Journal of Medicine*, 353(11), 1089–1091. <https://doi.org/10.1056/NEJMp058047>
- Keane, H. (2008). Pleasure and discipline in the uses of Ritalin. *International Journal of Drug Policy*, 19(5), 401–409. <https://doi.org/10.1016/j.drugpo.2007.08.002>
- McCabe, S. E., Knight, J. R., Teter, C. J., & Wechsler, H. (2005). Non-Medical Use of Prescription Stimulants Among US College Students: Prevalence and Correlates from a National Survey. *Journal of Addiction*, 99(1), 96–106.
- Medical Dictionary. (2018). *Prescription Drugs*. Retrieved January 27, 2018, from <https://medical-dictionary.thefreedictionary.com/Prescription+drugs>
- Mirzendehtdel, S., Nadji, S. A., Tabarsi, P., Baghaei, P., Javanmard, P., Sigaroodi, A., & Fekrat, M. (2010). Prevalence of HPV and HIV among female drug addicts attending a drop-in center in Tehran, Iran. *International Journal of Gynecology and Obstetrics*, 108(3), 254–255. <https://doi.org/10.1016/j.ijgo.2009.09.030>
- National Institute On Drug Abuse. (2017). *Misuse of Prescription Drugs*. Retrieved January 25, 2018, from <https://www.drugabuse.gov/publications/research-reports/misuse-prescription-drugs/summary>

- Rabiner, D. L., Anastopoulos, A. D., Costello, E. J., Hoyle, R. H., McCabe, S. E., & Swartzweder, H., S. (2009). The Misuse and Diversion of Prescribed ADHD Medications by College Students. *Disord. J. Atten.*, *13*(2), 144–153.
- Sabatelle, D. R. (2011). The scourge of opiates: The illicit narcotics trade in the Islamic Republic of Iran. *Trends in Organized Crime*, *14*(4), 314–331. <https://doi.org/10.1007/s12117-011-9142-0>
- Sattler, S., Sauer, C., Mehlkop, G., & Graef, F. P. (2013). The Rationale for Consuming Cognitive Enhancement Drugs in University Students and Teachers. *PLoS ONE*, *8*(7), 1–10.
- Schuster, C. R. (2006). History and current perspectives on the use of drug formulations to decrease the abuse of prescription drugs. *Drug and Alcohol Dependence*, *83*(1), s8–s14. <https://doi.org/10.1016/j.drugalcdep.2006.01.006>
- Soetens, E., Dhooge, R., & Hueting, J. (1993). Amphetamine Enhances Human-Memory Consolidation. *Neurosci. Lett.*, *16*(1), 9–12.
- Soetens, E. S., Casaer, D. R., & Hueting, J. (1995). Effect of Amphetamine on Long-term Retention of Verbal Material. *Psychopharmacology*, *119*(2), 155–162.
- UNODC. (2008). *World Drug Report 2008*. Retrieved from [https://www.unodc.org/documents/wdr/WDR\\_2008/WDR\\_2008\\_eng\\_web.pdf](https://www.unodc.org/documents/wdr/WDR_2008/WDR_2008_eng_web.pdf)
- Volkow, N. D., & Swanson, J. M. (2008). The Action Of Enhancers Can Lead To Addiction. *Nature*, *451*(2), 520. <https://doi.org/10.1038/451520a>
- Weyandt, L. L., Marraccini, M. E., Gudmundsdottir, B. G., Zavras, B. M., Turcotte, K. D, Munro, B. A., & Amoroso, A. J. (2013). Misuse of Prescription Stimulants Among College Students: a Review of the Literature and Implications for Morphological and Cognitive Effects on Brain Functioning. *Experimental and Clinical Psychopharmacology*, *21*(5), 385.
- Weyandt, L. L., Oster, D. R., Marraccini, M. E., Gudmundsdottir, B. G., Munro, B. A., Rathkey, E. S., & McCallum, A. (2016). Prescription stimulant medication misuse: Where are we and where do we go from here? *Experimental and Clinical Psychopharmacology*, *24*(5), 400–414. <https://doi.org/10.1037/pha0000093>
- Zeeuws, I., & Soetens, E. (2007). Verbal Memory Performance Improved Via An Acute Administration of D-Amphetamine. *Human Psychopharmacol Clinical. Experiment*, *2*(2), 279–287.