



## Misuse of Pharmaceutical Stimulants as Cognitive Enhancers among University Students in Western Countries: A Scoping Review

Muhammad Ariff Aidil Bin Mohd Anis<sup>1</sup> and Muhammad Shahzad Aslam<sup>2\*</sup>

<sup>1</sup>Bachelor of Economics in Finance, Xiamen University Malaysia, Sepang, Malaysia

<sup>2</sup>School of Traditional Chinese Medicine, Xiamen University Malaysia, Malaysia

\*Corresponding Author: Muhammad Shahzad Aslam, School of Traditional Chinese Medicine, Xiamen University Malaysia, Malaysia.

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### Abstract

**Introduction and Aims:** Throughout the past years, nonmedical use of prescribed drugs had a significant increase between 2003 and 2013, and there is an increasing trend of student involvement with such practices. This issue has also been addressed by several national ethics advisory bodies such as the US President's Council on Bioethics, the Italian National Bioethics Commission and the US President's Council on Bioethics. Thus, the scoping review aims to gain a deeper understanding on the factors leading to the misuse of pharmaceutical stimulants as cognitive enhancers among university students in Western countries and provide insight regarding the issue. The Western countries included were the United States, Australia and Switzerland.

**Design and Methods:** Published studies conducted on usage of Pharmaceutical Cognitive Enhancement (PCE) drugs among university students in Western countries are searched on PubMed and filtered. The articles chosen were randomised studies and quantitative studies.

**Results:** A few factors were identified regarding the consumption of PCE among students in the United States, Australia, and Switzerland: 1) Students are affected by social factors, peer pressure or self-confidence to maintain academic competitiveness. 2) Students' belief towards cognitive enhancers and the placebo effect. 3) Lack of effective coping methods and low coping ability to stress result in PCE practice among students. 4) Students' perception towards the drugs.

**Discussion and Conclusion:** Social influences affect the mindset of cognitive enhancers' users. Friends and peers can convince and persuade students to consume PCRE. PCE can also be obtained via those who are prescribed with it to treat Attention Deficit Hyperactivity Disorder (ADHD). Furthermore, the accessibility and convenience of the Internet also encourage the practice of PCE among students. Finally, it is reported that higher stress has a definite relation to the usage of cognitive enhancers. Hence, in the future, policies regarding PCE should be enforced more strictly, and students should be more aware of the ethical question and the potential danger of cognitive enhancement.

**Keywords:** Drug; Performance Enhancement; Students

### Introduction

Cognitive enhancing drugs are drugs that stimulate the mind and affect the functionality of the brain. Cognitive enhancement is an attempt to increase the brain's capability in retaining memory and increasing an individual's attention and focus. The two functions are undeniably essential in academic life, in which memory, attention and focus are highly necessary for students to keep up with the rigorous courses and to retain the knowledge learnt.

Examples of cognitive-enhancing drugs include Adderall [1], Ritalin, and Modafinil [2].

Reportedly, about every one out of five individual is involved with non-medical usage of drugs in prescription class throughout their life [3]. Among these individuals, college or university students are increasingly involved with using prescription stimulants for non-medical purposes. Throughout the past years, nonmedical use of prescribed drugs had a significant increase between 2003 and 2013 [3], and there is an increasing trend of student involvement with such practices. For example, results from the College Alcohol Survey (CAS) showed that the percentage of students involved with nonmedical use of opioids, sedatives, stimulants and sleeping pills are up to 31%.

Despite growing concern from health experts, government agencies, law enforcers and medical practitioners [1], and also increasing media coverage regarding this practice among university students [4], more and more students are prevalently turning the practice into their habit. This issue has also been addressed by several national ethics advisory bodies such as the US President’s Council on Bioethics, the Italian National Bioethics Commission and the US President’s Council on Bioethics [4]. Thus, the scoping review aims to gain a deeper understanding on the factors leading to the misuse of pharmaceutical stimulants as cognitive enhancers among university students in Western countries and provide insight regarding the issue.

**Methodology**

The review adopted the following steps: 1) Identifying the objective of the study; 2) Implementing a search strategy using keywords; 3) Searching for relevant literature; 4) Inclusion and exclusion of studies; 5) Extraction of data from selected studies; 6) Charting of data; 7) Summarising, interpreting collected data and providing supporting data from other sources. The research is conducted based on the question (Why do university and college students use drugs to assist their academic studies?) and all related articles are reviewed and filtered. To ensure that the articles found are within the realm of scientific and medical-related studies, and to ensure accuracy and relevancy of data, the search engine PubMed was used to obtain relevant studies. The type of articles chosen using PubMed was online journals. Published studies conducted on usage of Pharmaceutical Cognitive Enhancement (PCE) drugs among university students in Western countries are searched on PubMed.

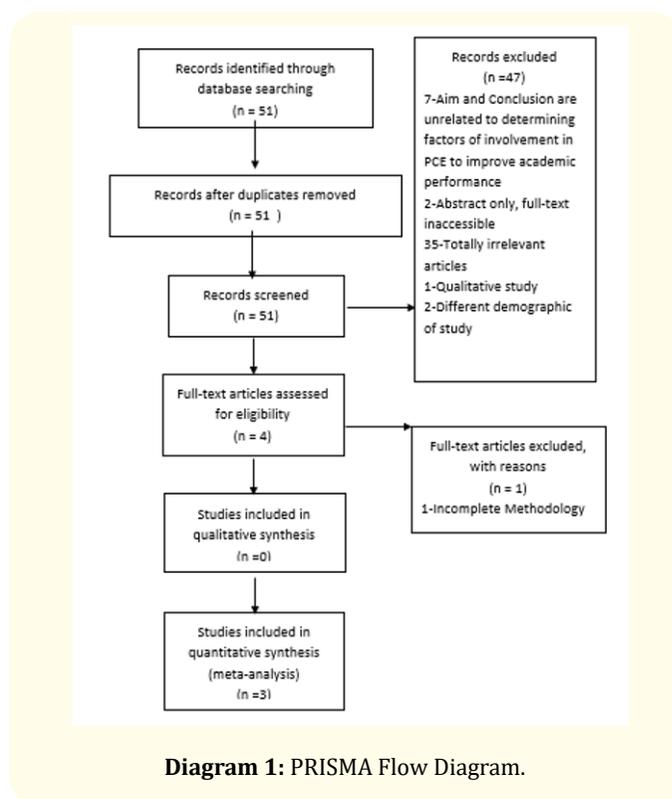
The search strategy used in finding articles combines the following keywords:

PubMed Central
(Drug[All Fields] AND (Performance Enhancement [All Fields] AND “Students” [All Fields] (“2009/01/01”[PubDate]: 2019/5/26” [PubDate]))
(Drug[All Fields] AND (Performance[All Fields] AND Enhancement[All Fields])) AND “Students” [All Fields] (“2009/01/01”[PubDate]: 2019/5/26” [PubDate])

**Table 1:** Search strategy.

As a result, a total of 51 articles related to the keywords were found on PubMed.

From the 51 articles found, a literature screening is conducted. The process is shown in the PRISMA flow diagram below:



**Diagram 1:** PRISMA Flow Diagram.

A total of 47 articles were excluded from the 51 articles, due to a few factors, such as

1. Article content is irrelevant does not match the keywords in the search strategy
2. The article does not study the factors of students taking PCE’s to improve academic performance, but for other reasons
3. The type of study and methodology is inconsistent with inclusion criteria
4. The demographic is unrelated to Western countries and/or university students

After filtration, 4 of the articles were deemed relevant based on the objective of the study. Out of the four (4) articles, one (1) was excluded, due to an absence of proper methodology and the obtaining of results were unclear. A final total of 3 articles were used for the scoping review. Inclusion and exclusion of articles are subjected to the following criteria

**Results**

From the articles included after the literature screening, the data extracted are analysed based on the insert variables. The data extraction is as follows

	Inclusion Criteria	Exclusion Criteria
Study Design	The randomised study, Quantitative study, Full-text free open access articles, Pharmaceutical Cognitive Enhancement (PCE)	All review articles, irrelevant articles, abstract only articles, Non-randomized study, Qualitative study, articles with irrelevant keywords
Participants	University students in Western countries (no age range)	Demographic other than university students in Western countries
Intervention	Cognitive enhancers are used by university students to improve their students	Cognitive enhancers are used by university students for other reasons other than academic purposes
Outcomes	Factors leading to the involvement of PCE among university students	Does not talk about factors leading to the involvement of PCE among university students

**Table 2:** Inclusion and Exclusion Criteria.

Author Name	L. Cropsey, K., et al. [5]	Jensen, C., et al. [6]	J Maler, L., et al. [7]
Year	2017	2016	2015
Type of Study and Methodology Used	Randomised, Quantitative	Randomised, Quantitative	Randomised, Quantitative
Total Sample Size	39	38	3056
Demographic	University students from the University of Alabama, United States of America	University students from the University of Queensland, Australia	University students from the University of Zurich, University of Basel, and Swiss Federal Institute of Technology Zurich from Switzerland
Age	19-30 years old	18-24 years old	17-72 years old
Data Analysis Method and/or Software Used	Generalized Estimating Equations (GEE), Analysis of Variance (ANOVAs)	NVivo	Statistics 12 software (StarSoft, Tulsa, OK, USA), Friedman analyses of variance (ANOVAs)

**Table 3:** Data Extraction.

Three articles were found explaining the factors leading to university students in Western countries using non-medical prescription drugs to enhance their cognitive abilities and improve academic performance. The Western countries included were the

United States, Australia and Switzerland. After examining the collected literature, four (4) main factors were determined and selected to explain the factors of PCE among the students.

**Factor 1: Students are affected by social factors, peer pressure or self-confidence to maintain academic competitiveness**

The core problem of students wanting to improve their academic performance may not solely dependent on having difficulty in studies, but can be related to societal factors [6]. Students may want to maintain an active social life unaffected by academic workload. Thus, retaining focus and increasing the ability to stay awake at night is integral to students, leading to students' involvement in PCEs, be it with pills, caffeinated drinks or energy drinks. Recreational activities and an emotional outlet on a usual basis would not be sacrificed due to academics, and students are willing to reduce sleeping time to spend time on assignments during a later time of the day.

Peer pressure or self-confidence are also factors that lead students to undergo the practice of PCE. It was claimed that when a student expects to do as well as they are expected to do, be it by their own volition or because of maintaining a competitive standard among their peers, it would result in stress. Some students may choose PCE to combat stress or simply to gain or maintain a competitive edge when doing work.

**Factor 2: Students' belief towards cognitive enhancers and the placebo effect**

According to the research conducted in the University of Alabama, students resort to taking cognitive enhancers due to their personal perspective towards the drug, and also because of the placebo effect [5]. In the experiment, students were given two active medication pills and two placebo pills on two study visits blindfolded. During the study visit, students were tested accordingly with cognitive tests after taking the pills. The end result is that the students performed better when tested after taking the pills, regardless of whether the pill is an actual drug or is just a placebo (fake) pill. This relates to the placebo effect, in which the students' belief that taking a certain drug or substance will increase their cognitive abilities, regardless of the actual beneficial qualities of the drug consumed, will induce them to actually perform better than usual.

The positive reinforcement obtained through this relationship further develops a cycle of dependency towards using cognitive enhancers whenever deemed necessary by students, in addition to the actual benefits of the drug, such as a reduction in tiredness, if applicable. However, more often than not, the actual benefits of the drugs are overestimated, and the positive reward obtained is due to the placebo effect.

### Factor 3: Lack of effective coping methods and low coping ability to stress result in PCE practice among students

The research on Australian students further explains that the involvement of students with cognitive enhancing substances correlates to their way of managing conflict or stress [5]. It is found that students who use avoidance conflict management or avoidance emotion coping method predominantly use cognitive enhancers. Avoidance coping method entices avoiding the problem or subject matter at hand to avoid dealing with the stress face to face. Hence, taking a break from studies and involvement in activities such as sleeping and playing games before resuming to work would help avoid stress. However, this does not mitigate the actual stress. When these strategies are perceived as no longer working and little progress have been made towards an approaching deadline, students would result in PCE to force themselves to study. PCE is claimed to help the students to face problems they have been avoiding.

Those with low stress-coping abilities and lack knowledge of proper stress or fatigue management methods would also result in PCE. For example, students who use problem coping method in stress handling would focus more on solving the problem and lack regards to own wellbeing. If tiredness is affecting their work, they aim to remove the tiredness regardless of the methods. Most students would result in activities such as exercising, but there are several students who would resort to PCE, despite knowing the risks. This is due to the lack of knowledge regarding proper stress and fatigue management.

### Factor 4: Students' perception towards the drugs

The research in Switzerland states that the perception of students towards the drugs affects their involvement with them [7]. Students who are involved with PCE may think that PCE is not in the wrong. In comparison with more dangerous substances such as cocaine and more severe drug addiction, usage of cognitive enhancers are perceived to be mild and safer, especially with substances that are seemed as harmless such as caffeine. It is also noted that doping in sports are considered more unethical than using cognitive enhancers to improve academic performance. Overall, those who are involved with PCE are those who are not too worried about medical implications or ethical views.

## Discussion

The main factors of students' involvement with PCE mentioned from the literature chosen covers the aspect of perspective, societal pressure, self-expectations and stress management. In research by [1], it is agreed that social influences affect the mindset of cognitive enhancers users. The research has reported that the most Adderall users in the study commonly obtain the substance through their personal acquaintances or friends. More than three out of four individuals in the study receive Adderall as gifts, and a few of

the participants are persuaded into taking the pills. Even a student who usually avoids drugs would be convinced of the harmlessness of the drug via his or her friends, leading to the initial intake of the drug. PCE drugs can also be obtained through friends who are prescribed with the medication for mental disorders such as Attention Deficit Hyperactivity Disorder (ADHD). Thus, the social influence and relationship between friends are factors contributing to PCE involvement.

Furthermore, the accessibility and convenience of the Internet also encourage the practice of PCE among students. According to a participant of a study held in British universities, the black market of drugs are easily accessible through search engines' results and no extra effort is a required to obtain cognitive enhancers [2]. Recommendations from friends who are PCE users would also validate the credibility of internet vendors in the black market. One of the participants of the study regarded Silk Road, a website from the darknet that was once active, was the go-to when purchasing modafinil. Finally, it is reported that higher stress has a positive relation to the usage of cognitive enhancers, which supports the factor introduced in the literature selected [8,9].

## Limitations

The limitation of knowledge regarding the process of producing the review is observed and analysed. The short amount of time spent and the requirements of the assignment do not require a large scale and in-depth research involving hundreds or thousands of literature or sources, thus may lead to some inaccuracies, in addition to the lack of professional knowledge in the subject matter.

## Conclusion

To summarise, the main factors of university students in Western countries conducting Pharmaceutical Cognitive Enhancement (PCE) to improve academic studies is due to societal pressure, issues with self-confidence, low stress coping abilities and also due to their overall perception towards the drugs. It is also easy for students to obtain the drugs without after a proper medical assessment on whether they need it or not through other sources like the Internet.

Hence, in the future, policies regarding PCE should be enforced more strictly, and students should be more aware of the ethical question and the potential danger of cognitive enhancement. Even if cognitive enhancers do not bring upon problems by themselves, the addiction and the dependency towards them could be a real issue to be researched upon. The mental state of students may be affected by this dependency, and it could be a possibility that they may choose to branch out to more dangerous and unapproved drugs. Thus, the increasing phenomenon of students using cogni-

tive enhancers should be looked into before it leads to more problems. In conclusion, it is essential to understand the reasons why students would result to PCE in hopes that future policies regarding the legality of PCE can be implemented more effectively.

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