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A Comparative Study on the Cognitive Ability of the 1st Year and 6th Year (Interns) Pharmacy Students

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Abstract

Cognition is concerned with the internal mental processes that begin with an external stimulus and result in a behavioral response. This study focuses on the assessment of the cognition of both 6th year students and 1st year students of Pharm. D (Doctor of Pharmacy 6 year integrated course), by using Addenbrooke's Cognitive Examination-Revised Edition (ACE-R). The test includes measurement of language, memory, attention and orientation, visuospatial, fluency skills which carry total 100 of the score. **Methodology/ Material and Method:** The comparative study for a year was carried out at a Pharmacy College, the subject enrolled were 120 Pharmacy students, the number of 60 students were from 1st year, and remaining 60 were from the 6th year (Interns). The Addenbrooke's Cognitive Examination-Revised Edition (ACE-R) was used on the Fresher's who recently took admission in 1st year of the Academics comparing it to the ACER-R test taken by the 6th year (Interns). The statistical inference was calculated from differences in Average Score and Standard Deviation, comparing these two groups to understand whether extensive use of cognition will increase the cognitive ability of individuals or deteriorate over the period span of 6 years under high stress and hard work. **Result:** Students in the 1st year showed comparatively better cognitive ability through ACE-R scores (average score = 83.38/100, standard deviation = 5.32) than the 6th year (average score = 78.63/100, standard deviation = 5.55) with the difference decline of 5.50% in the cognition and this difference was statistically very significant with the p-value. [p = 0.000354052] [p<0.5]. **Conclusion:** The cognitive ability of 6th year Pharmacy students has shown a statistically significant difference in ACE-R scores as compared to 1st year Pharmacy students, with a decline of 5.50%, which suggests that extensive use of cognition, may result in idiosyncrasy due to various stressful situations over the period of 6 years, the reason found to be Academic, Carrier Pressure or maybe Poor Dormitory, Dietary Lifestyle.

Keywords: ACE-R. Cognition, Cognitive Study, Pharm.D

1. Introduction

The ability to attend to things in a selective and focused way, to concentrate over a period, to learn new information and skills, to plan, determine strategies for actions and execute them, to comprehend language and use verbal skills for communication and self-expression and to retain information and manipulate it to solve complex problems are examples of mental processes that are referred to as cognitive functions[1]. It is said that the more you use your cognitive ability, the better it becomes. Cognition is the psychological results of perception and learning and reasoning. Cognitive research has huge potential in India and can help us unravel mysteries of the human mind, identify etiopathogenesis and facilitate treatment of psychiatric disorders. Although the range of cognitive problems can be diverse, there are several cognitive domains, including executive function, attention

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Table 1. The ACE raw scores obtained by the 1st year Doctor of Pharmacy Students

1st year	Attention & orientation	Memory	Fluency	Language	Visuospatial	Total
1.	18	21	8	22	14	83
2.	18	16	11	14	15	74
3.	18	20	11	23	13	85
4.	17	22	11	23	14	87
5.	17	20	10	25	14	86
6.	14	24	11	23	15	87
7.	18	20	13	22	14	87
8.	12	20	8	23	13	76
9.	17	21	10	25	15	88
10.	18	24	11	22	14	89
11.	18	24	10	24	15	91
12.	18	17	7	23	12	77
13.	13	23	9	23	15	83
14.	16	20	13	25	10	84
15.	17	22	9	19	15	82
16.	16	20	6	21	15	78
17.	16	21	13	25	13	88
18.	18	21	8	22	14	83
19.	18	16	11	24	15	84
20.	18	20	11	23	13	85
21.	12	20	8	23	13	76
22.	18	24	11	22	14	89
23.	17	22	11	23	14	87
24.	18	20	11	23	13	85
25.	17	21	8	21	14	81
26.	17	20	10	25	14	86
27.	15	18	6	23	14	76
28.	16	21	13	25	13	88
29.	17	22	11	23	14	87
30.	17	22	11	23	14	87
31.	18	21	8	22	14	83
32.	14	11	8	18	13	64
33.	16	20	6	24	14	80
34.	16	20	5	24	14	79
35.	16	20	6	23	14	79
36.	16	21	13	25	13	88
37.	18	16	11	24	15	84
38.	18	20	11	23	13	85
39.	17	21	14	25	15	92
40.	17	21	8	21	15	82

(*Continued*)

Table 1. (*Continued*)

1st year	Attention & orientation	Memory	Fluency	Language	Visuospatial	Total
41.	18	20	11	23	13	85
42.	17	20	10	25	14	86
43.	18	21	8	22	14	83
44.	16	20	6	23	14	79
45.	18	21	8	22	14	83
46.	18	16	11	24	15	84
47.	17	21	14	25	14	91
48.	16	20	6	24	14	80
49.	15	12	11	20	15	73
50.	16	20	6	23	14	79
51.	18	20	11	23	13	85
52.	18	21	14	25	16	94
53.	15	12	11	20	14	72
54.	18	21	8	22	14	83
55.	17	20	10	25	14	86
56.	18	20	11	23	13	85
57.	16	20	6	24	14	80
58.	18	16	11	24	15	84
59.	16	20	6	23	14	79
60.	18	17	13	24	16	88
Total	1006	1191	583	1375	839	**4994**
Avg.	17	20	10	23	14	83.23

and information processing and working memory, which appear more frequently at risk[2]. In this study, the cognitive ability of 6th year (Interns) pharmacy students are compared with that of the 1st year. (Freshers) Pharmacy students. The cognitive ability of the 6th year students should be more as compared to the 1st years' students since they have been involved in pharmacy education from the last five years, whereas the 1st year students came directly after their 12th standard (Schooling). However, there are other possibilities that the results can be otherwise, for instants: The 1st year students have more cognitive ability than 6th years, due to the fact that the 1st years students are freshers and are excited as they experience the college, new atmosphere, new friends, etc., whereas 6th years are tired of studying and doing routine works, over the last 5 years and are much relaxed since they are almost done with their course and done with all the exams. Alternatively, on the contrary, that 1st year students are struggling to get adjusted to this new college atmosphere and hence, their cognition is comparatively low. The cognition of both 6th year students and 1st year students are assessed by using Addenbrooke's Cognitive Examination (ACE). It is a global cognitive bedside test introduced in 1997 at Addenbrooke's (Cambridge) and revised in 2006. The ACE detects early dementia and reliably distinguishes between frontotemporal dementia and Alzheimer's disease and other conditions, including affective disorders. It has been adopted in 140 countries and is freely available in different languages. The test includes measurement of language, memory, attention, and orientation, visuospatial, fluency skills which carry total 100 of a score.[3–5]

1.1 Addenbrooke's Cognitive Examination (ACEIII)

It contains five subscores, each one representing one cognitive domain: viz. Attention/ Orientation (18 points) Memory

Table 2. The ACE raw scores obtained by the 6th year Doctor of Pharmacy Students

6th year	Attention & orientation	Memory	Fluency	Language	Visuospatial	Total
1.	16	18	7	24	14	79
2.	13	24	9	24	13	83
3.	14	11	9	18	14	66
4.	18	14	9	24	14	79
5.	18	19	11	26	14	88
6.	17	23	9	18	13	80
7.	18	18	10	23	14	83
8.	18	20	10	20	12	80
9.	16	24	11	24	16	91
10.	16	20	6	24	14	80
11.	15	12	11	22	14	74
12.	15	15	8	21	15	74
13.	14	22	13	24	15	88
14.	15	16	7	21	14	73
15.	17	21	7	25	16	86
16.	16	21	12	23	13	85
17.	18	20	11	25	15	89
18.	18	21	8	22	14	83
19.	18	16	11	24	15	84
20.	18	20	11	23	13	85
21.	15	15	8	21	15	74
22.	15	15	8	22	15	75
23.	16	20	6	24	14	80
24.	16	20	6	23	13	78
25.	16	20	6	24	14	80
26.	15	15	8	21	15	74
27.	16	20	6	23	14	79
28.	18	21	8	22	14	83
29.	16	20	6	23	14	79
30.	16	20	6	24	14	80
31.	15	15	8	22	15	75
32.	16	20	6	24	14	80
33.	13	17	5	18	11	64
34.	15	15	8	21	15	74
35.	18	21	8	22	14	83
36.	16	20	6	22	13	77
37.	15	15	8	22	15	75
38.	16	20	6	22	14	78
39.	18	21	8	22	14	83
40.	15	15	8	21	15	74

(*Continued*)

Table 2. (*Continued*)

6th year	Attention & orientation	Memory	Fluency	Language	Visuospatial	Total
41.	14	19	5	20	13	71
42.	14	19	5	20	12	70
43.	16	20	6	22	14	78
44.	14	19	5	20	13	71
45.	16	20	6	24	14	80
46.	18	20	11	23	13	85
47.	18	20	11	23	14	86
48.	18	20	11	23	13	85
49.	16	20	6	22	15	79
50.	17	21	8	22	14	82
51.	15	15	8	21	15	74
52.	15	15	8	21	14	73
53.	16	20	6	23	13	78
54.	16	20	6	22	14	78
55.	16	19	6	23	14	78
56.	14	19	5	20	12	70
57.	15	15	8	22	15	75
58.	16	20	6	22	14	78
59.	15	15	8	21	14	73
60.	16	20	6	24	14	80
Total	959	1116	470	1336	838	**4719**
Avg.	16	19	8	19	14	78.65

From **Table 1** and **Table 2, Summary**: It can be inferred that 1st year Doctor of Pharmacy Students has ***more cognitive ability*** in almost all cognitive parameters ***except for visuospatial*** than the 6th year Doctor of Pharmacy Students.

(26 points), Fluency (14 points), Language (26 Points) and Visuospatial (16 Points). It takes between 15 and 20 min to administer and score the test. The ACE-R maximum score is 100, calculated by the addition of all domains. The participants were asked to answer the question in the ACE III and answers were computed and analyzed[6].

2. Purpose of the Study

To understand whether the extensive use of cognition will increase the cognitive ability of individuals.

3. Objective

To identify the difference in the cognitive ability of junior most and the senior most students in a Pharmacy School.

4. Methodology

4.1 Aim

To compare the ACE scores of the 1st year Pharmacy students and the 6th year Pharmacy, students. Table 1 and 2.

4.2 Sample Size

A total number of 120 students were enrolled in the study from a pharmacy school, where 60 students are from the 1st year and remaining 60 from the 6th year (Interns).

4.3 Method of Data Collection

ACE is in the form of a questionnaire which is given and assessed to all the 120 students individually.

- **Inclusion:**
  - Students of 1st year and 6th year Doctor of Pharmacy. (Doctor of Pharmacy is a six year integrated pharmacy course)
  - The students are above 18 years and below 25 years of age.
- **Exclusion:**
  - Students who attended JEE or NEET Examination.
  - Students with any history of depression and anxiety and other learning disabilities.

4.4 Data Collection and Analysis

Comparison is made between the 1st year's and 6th year's scores to obtain significant results, by finding the difference in their Arithmetic Mean.

5. Result

Students in 1st year showed comparatively better cognitive ability through ACE-R scores (average score = 83.38/100, standard deviation = 5.32) than 6th year (average score = 78.63/100, standard deviation = 5.55) with the decline of 5.50% in the cognition and this difference were statistically significant [p = 0.000354052] [p<0.5]. Tables 3 and 4.

Table 3. Difference in ***Scores*** concerning ***Cognitive Parameters***[8], it is seen that the cognitive parameters of 1st year Pharm.D students are more than 6th-year Pharm.D students except for the visuospatial parameter. (The data collected in the study is supported by studies conducted by ***Vankatshiva Reddy, et al. 2012***.)

Cognitive Parameters		1st year	6th year
Attention & orientation	Score (Avg.) Out of 18	**17.00**	**16.00**
	Percentage (%)	**94.00%**	**89.00%**
Memory	Score (Avg.) Out of 26	**20.00**	**19.00**
	Percentage (%)	**77.00%**	**73.00%**
Fluency	Score (Avg.) Out of 14	**10.00**	**8.00**
	Percentage (%)	**71.00%**	**57.00%**
Language	Score (Avg.) Out of 26	**23.00**	**19.00**
	Percentage (%)	**88.00%**	**73.00%**
Visuospatial	Score (Avg.) Out of 16	**14.00**	**14.00**
	Percentage (%)	**87.50%**	**87.50%**
Total	Score (Avg.) Out of 100	**83.38**	**78.63**
	Percentage (%)	**83.38%**	**78.63%**
DIFFERENCE (%)		**5.50%**	

Table 4. Differences in **ACE-R scores** for both groups **Statistics:** Scores obtained from ACE-R examination were used for assessing and comparing effects on cognition. Mean improvement in ACE-R scores (Total and from individual domains namely Attention and orientation, Memory, Language, Fluency, and Visuospatial) were calculated. P-value was calculated using the differences in initial and final scores of both groups as two different sample sets.[9]

Parameters	1st year	6th year
Average Mean	**83.23333333**	**78.65**
Standard Deviation	5.324604439	5.556565822
Variances	28.35141243	30.87542373
P – Value	**0.000354052**	

6. Discussion

Cognition is an important factor that influences information processing and execution. It is impaired in most of the students, due to stress, anxiety, poor dietary lifestyle and substance abuse. The study site is Poona College of Pharmacy, a Pharmacy College that receives students from all over India with a different culture, ethnic and from moderate to high economic background. Amongst the subjects included, 57 are male (48%) and 63 females (52%). Indian females are more encouraged for education as compared to the last ten years of graph and statistics.

Amongst the included subjects, belong to young age group <18 years - 46 (38%) followed by 19-20 years- 14 (12%), 21-25 years - 55(46%) and 27-30 years-5 (%). In a study, "Indian Psychiatric Epidemiologic Studies: Learning from the past Suresh Bada Math, Ravindra Srinivasaraju - Indian Journal of Psychiatry- 2010" young age group has been maximally affected by psychiatric illnesses which are not different when compared to studies conducted in other countries. The epidemiologic study conducted in Pune also supports the evidence. Table 5.

Deficits of attention, emotion and cognition occur in individuals with alcohol abuse and addiction. Recent research reports compromised microstructural and functional network connectivity in alcoholism, which can influence the dynamic tuning between brain systems, e.g. the frontally based executive control system, the limbic

emotion system and the midbrain-striatal reward system, thereby impeding cognitive flexibility and behavioral adaptation to changing environments[7].

Addenbrooke's cognitive examination was administered once the subject was admitted in the curriculum, one week after the inclusion of 60 subjects and rest 60 were from 6th year. Average ACE-R scores for subjects in 1st year is 83.23/100 and Average scores for patients who were in the 6th year showed 78.65/100, the percent decline in the cognition is 5.50%.

Deterioration in all the cognitive parameters was observed from 1st year to 6th year and except visuospatial aspect tend to be constant at 87% followed by decline in the graph, Attention and Orientation 94-89 (5.32%), Memory 77-73 (5.48%), Fluency 71-57 (19.72%), Language 88-73 (17.05%). Figure 1.

Table 5. Demographic distribution of enrolled subject,as seen above in the table is the demographic distribution of the enrolled patients and 45% of the patients are both smoker and alcoholic, which can be one of the factors, leading to declining in cognition

Respondent's characteristic	Number of patients	Percentage (%)
Subjects Included		
1st year PharmD	**60**	**50%**
6th year PharmD	**60**	**50%**
Gender		
Male	**57**	**48%**
Female	**63**	**52%**
Age (years)		
(<18 years)	**46**	**38%**
(19-20 years)	**14**	**12%**
(21-25 years)	**55**	**46%**
(27-30 years)	**5**	**4%**
Marital Status		
Married	**7**	**6%**
Unmarried	**113**	**94%**
Place of Resident		
Urban	**73**	**61%**
Rural	**47**	**39%**
Social Habit		
Smoker	**12**	**10%**
Alcoholic	**24**	**20%**
Both	**54**	**45%**
None	**30**	**25%**

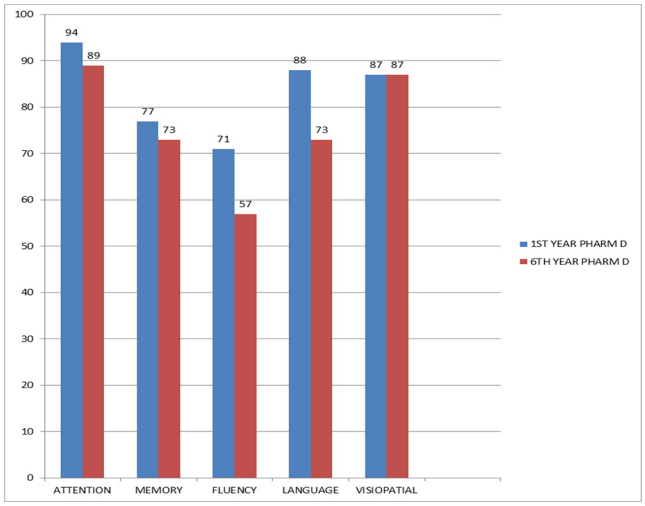

Figure 1. Comparison of the cognitive parameters of 1st Year Doctor of Pharmacy Students and 6th Year Doctor of Pharmacy Students.

7. Conclusion

This study concludes that the cognitive ability of 6th-year students is less than 1st year students (T3). The cognitive ability of 6th year Pharmacy students has shown a statistically significant difference in ACE-R scores as compared to 1st year Pharmacy students, with a decline of 5.50%, which suggests that extensive use of cognition, may result in idiosyncrasy due to various stressful situations over the period of 6 years, the reason found to be Academic Pressure, Poor eating Habits, Substance Abuse, Carrier Pressure or maybe Poor Dormitory Lifestyle. It is also considered that the 6th years are tired of studying and

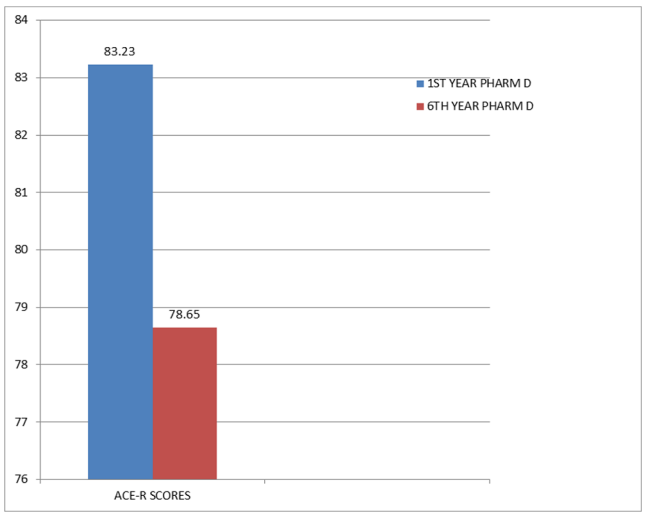

Figure 2. Cognition level of Pharmacy Students at the beginning and end of the course.

doing routine works, over the last five years, and are much relaxed since they are almost done with their course and done with all the exams, hence their cognition is less as compared to the 1st years. Figure 2.

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