

## Perceptions of Medical Students Regarding Learning during Practical Sessions in Pharmacology – A Cross Sectional Questionnaire Based Study

Gurudeva C<sup>1\*</sup>, Pallavi Kulkarni<sup>2</sup>, Ravin Vijay R<sup>3</sup>, Thangam Chinnathambi<sup>4</sup>, Indla Ravi<sup>5</sup>, Regina Roy<sup>6</sup>, Alice Kuruvilla<sup>7</sup>

1,2. Associate Professor, 3,4,5. Assistant Professor, 6. Professor, 7. Emeritus Professor, Department of Pharmacology, Karuna Medical College, Vilayodi, Chittur, Palakkad, Kerala, India.

\*Corresponding author – Gurudeva C

Email id – [gurudeva2006@gmail.com](mailto:gurudeva2006@gmail.com)

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### ABSTRACT

**Background:** Pharmacology practical exercises compliment the theory classes and are effective tools to develop skills and competencies of a medical graduate. Off-late, the content and nature of pharmacology practicals have witnessed some changes such as inclusion of self-learning modules. These include seminars, clinical case discussions and problem-solving exercises. Insights about the perceptions and preferences of the students help to plan relevant exercises. There is no publication of students' perception about the usefulness of practicals conducted during the whole course of the second year MBBS. **Materials and Methods:** This cross sectional study was conducted in 72 students of Karuna Medical College who had completed IInd MBBS course. The students were provided a predesigned proforma to obtain their feedbacks on two aspects of each practicals. One, whether it was interesting and other was a rating of their preferences on a scale of 1 to 5, where 1 being least and 5 being excellent. **Results:** A majority (86.4% – 95.4%) of the students indicated all the practical exercises as interesting. The basic pharmacology exercises and group assignments were considered as interesting by 95.40% and 94.80% of students respectively. They also had marked their preference to group assignments as excellent (59.03%) and good (26.39%) indicating group assignments as the most preferred practical assignments. This was followed next by a preference for case discussions and seminars (24.30% excellent, 47.22% good) and then basic pharmacology exercises (24.07% excellent, 42.59% good). **Conclusion:** The structured feedbacks from students regarding pharmacology practical exercises provide valuable insights in planning interesting sessions for future.

**Keywords:** Computer Assisted Learning, Feedback, Group Assignments, Medical graduates, Pharmacology practicals, Students' Perceptions.

### INTRODUCTION

Pharmacology teaching during second MBBS course is aimed at improving knowledge about action and use of drugs. Therapeutic uses of drugs require skills in selecting and suitably prescribing for common diseases. In addition, knowledge about the drug interactions, adverse drug reactions and cost effectiveness of therapy etc, are needed for optimal patient care. Lecture sessions introduce various drug classes, their pharmacokinetics and pharmacodynamics. Practical exercises are the most effective tools to develop actual skills and competencies of a medical graduate which goes

hand-in-hand with the theory classes. The guidelines for curriculum development provided by the medical council of India have been guiding the development of curriculum in many medical institutes. (1,2)

Various authors have highlighted the need to restructure pharmacology practicals to keep pace with the progress of the subject. (3-5) Practical sessions in pharmacology have been evolving during the last two decades. Experiments using animals have been replaced by Computer Assisted Learning (CAL). (6,7) Pharmacy practicals including

preparations of mixtures and ointments have been discarded. Exercises related to clinical pharmacology have been included in the recent years.(8,9) Patient oriented, problem-solving exercises have been introduced as a method to inculcate rational and scientific basis of therapeutics.(10-12) Some of the methods to improve self-learning include seminars, clinical case discussions and problem-solving exercises. Group assignments help to improve presentation and communication skills, and ability to work in a team. Exercises included in the practicals conducted in the department of pharmacology, Karuna medical College are designed with a view to provide skills and competence in various aspects of therapeutic management of patients.

Feedback on teaching sessions is a useful tool to assess the effectiveness of a program. Some departments have published their observations using questionnaire administered to students. (13, 14) Perceptions of students about CAL has been elicited by some pharmacologists. (6,7,15-17) However, there is no publication of students' perception about the usefulness of different types of practicals conducted during the whole course of the second year MBBS. This study highlights the students' perceived usefulness and preferences about practical sessions conducted throughout the second MBBS. Insights about perceptions and preferences of the students help to plan and refine relevant exercises for conducting effective practical sessions.

The aim of this study was to evaluate the perceptions of students regarding each practical session. The study was designed to get feedback from students about the usefulness of the practicals in developing relevant skills and competencies using a structured predesigned proforma.

## **MATERIALS AND METHODS**

This was a cross sectional questionnaire based study involving one batch of 72 students of Karuna Medical College who had completed the IInd M.B.B.S course. The students were provided with the predesigned proforma, after completing all the practical sessions. This proforma was prepared by the departmental faculty to obtain feedback from students. For the purposes of free expression of ideas and to avoid bias, students were asked to omit their names while answering the questions. The questionnaire included two aspects of each practical.

1. Whether it is interesting: Yes/No

2. Rating of preference based on a scale 1-5 (1= Least, 2= Below average, 3= Average, 4= Good, 5= Excellent).

## **Practical exercises conducted during second MBBS**

This college is affiliated to Kerala University of Health Sciences (KUHS). Hence, the practical exercises have been planned and developed in conformity with the guidelines provided by KUHS.

These are categorized into five types of exercises:

- A. Exercises related to teaching of basic pharmacology – these are mostly related to autonomic nervous system (ANS)
- B. Practical to provide information on general aspects of drugs
- C. Sessions related to various aspects of clinical pharmacology and therapeutics
- D. Case discussions and seminars
- E. Exercises related to group assignments

### **A. Exercises related to basic pharmacology to explain the action of drugs**

Action of agonist and antagonists were discussed using graphic presentation e.g. cholinomimetics and blockers, sympathomimetics and blockers. Computer assisted exercises on frog heart, frog esophagus and rabbit eye were given as sessions to facilitate learning about drug action on these tissues. Students conducted these exercises in groups of 2 or 3. Pharmacodynamics charts were used to describe mode of action of drugs. E.g. Drugs acting on synthesis of cholesterol, drugs acting on cell cycle, site of action of antihypertensive drugs etc.

### **B. Practicals to provide information on general aspects of drugs**

These introductory sessions deal with the source of drugs, nomenclature of drugs and dosage calculations. Suitable questions were added in each section e.g. Students have to find out generic drugs and their brand names from drug information sources. Some exercises related to pharmacokinetics were provided to impart skills and understanding of plasma concentration of drugs.

### **C. Exercises related to Clinical Pharmacology**

C1 – Dosage forms of drugs e.g. solutions, suspensions, creams, ointments etc. Samples were demonstrated and suitable questions

were included regarding different types of formulations.

- C2 – Exercises related to routes of drug administration. Demonstration of devices used for inhalation in bronchial asthma, subcutaneous and intramuscular injections, Insulin pen and syringes.
- C3 – Exercises related to prescriptions– prescription of drugs for common clinical conditions. Questions related to auditing of some of the prescriptions and questions based on rational use of drugs.
- C4 – Exercises on drug interactions, questions on adverse drug reactions. Use of photos depicting adverse drug reactions and exercises on selection of suitable drugs.
- C5 – Case discussions and problem solving exercises.
- C6 – Exercises related to interpretation of laboratory data, cost of drugs and toxicology.

#### **D–Case discussions and seminars**

Clinical scenarios were presented and problem based questions were allotted to individual students to discuss the answers in the group. Seminar topics were allotted to individual students, at least one week prior to sessions. Only selected topics which do not require lectures were considered for these sessions. Students prepare for presentation of the topics under the guidance of faculty. At the end of seminars brief tests were conducted based on the presentations. In addition, some special sessions were arranged to demonstrate drugs used in clinical conditions such as hypertension, myasthenia gravis, etc.

#### **E – Group Assignments**

Students were divided into groups of 10 – 15 each and following two sessions were assigned to them.

##### **1. Quiz Program**

Students were suitably divided into groups based on internal assessment marks in order to avoid clustering of high performing students in a same group. Questions for quiz were prepared from the whole of pharmacology including toxicology, name of plants, sources of drugs, and names of eminent scientists.

##### **2. Project Assignment**

Each group was assigned one topic e.g. Diabetes, Hypertension etc. Students were asked to prepare a

project report within a period of 6–8 weeks and present it. The presentation was required to be done using role play and videos in this class. In some of the previous batches, models demonstrating drug action were presented. The presentations were evaluated by an independent observer. Marks were allotted for the group activities and suitable prizes were given for the best performers.

#### **Ethical considerations**

Permission to conduct this study was obtained from the institutional human ethical committee (KMC/IHEC/07/2019) and informed consent was obtained from the students participating in this study.

#### **Statistics**

The results of the study were expressed as percentages and the significance of students preferences for different groups of practicals were analysed by Friedman test.

#### **RESULTS**

Seventy-two students (34 Males, 38 Females) of one batch of IInd MBBS participated in this study and provided their responses. The results of this study reveal insights about students' perception of different modes of practical classes conducted in the department of pharmacology. A majority (86.4% – 95.4%) of the students indicated all the different practical exercises as interesting (Figure 1). The practical exercises on basic pharmacology and group assignments were marked as interesting by a maximum number of students (95.4% and 94.8% respectively). This was followed by exercises in clinical pharmacology and case discussions and seminars. The practical exercises in general aspects of drugs were mentioned as interesting by a relatively less number of students (Figure 1).

The preferences for perceived usefulness of the different practical exercises for the clinical practice were rated by the participants on a scale of 1-5, as captured in Tables 1 to 5. The practical exercises on group assignments got an excellent preference of 59.03% and a good preference of 26.39%, indicating that the students perceived these exercises as most useful (Table 5). This was followed by practical exercises in case discussions and seminars where 24.30% of them attributed excellent preference and 47.22% of them attributed good preference (Table 4). The practical exercises on general aspects of drugs got an excellent preference of 16.67% and a good preference of 33.61% indicating these aspects of pharmacology practicals were less preferred by

students (Table 2). The comparative analysis of preference grading of different groups of practical exercises were done using Friedman test (Figure 2 and Table 6). The highest rank was found to be for group assignments with a statistical significance ( $P < .001$ ).

The open ended section of the proforma captured few important opinions about the practicals, beyond the structured, objective feedbacks. A large number of students appreciated the well organized and systematic teaching programme of the department. Some students expressed their opinion about the pharmacology practicals as – “It is a tough and volatile subject, but the new skillful ideas helped us to learn the subject in an enjoyable manner”. Many students requested for more clinical cases and quiz sessions to be conducted at the end of each section and to allot more sessions for demonstration of devices and injections.

## DISCUSSION

Teaching Pharmacology during second year of MBBS course is a challenge to the teacher. Students will not be familiar with most of the diseases and will not be able to correlate drug effects with diseases. Further, there are limited options to demonstrate drug action in living tissues or in patients. Authors from many departments of pharmacology have emphasized the need to restructure practicals considering these shortcomings. (4, 5) Learning modules for each system in pharmacology need to be incorporated into practicals at suitable time periods.

Scanning of drug formulations and general aspects of drugs are introduced during the first few months of the second MBBS course. Perceptions about usefulness of general aspects of drugs are presented in Table 2. Feedback from the students who responded to the proforma has indicated that most of the practicals conducted are interesting. Theoretical concepts of drug receptors, their actions, effects of blocking receptors are demonstrated using CAL and graphic recordings. Learning achieved through these methods provide convenient ways to understand drug actions related to autonomic nervous system.(15) These sessions are also arranged during first few months of second MBBS. Students find it easy to understand them as these facts are extensions of physiology. Perceptions of students regarding CAL as a method of experimental pharmacology have been reported earlier. (16, 17) One study using rabbit eye as a part of CAL session has received good response from both students and the faculty

(80% positive response). (16) Our results also have indicated CAL and graphs as effective methods of teaching basic pharmacology, as 95.4% of students have indicated them as interesting exercises (Figure 1, Table 1).

Clinical pharmacology exercises are conducted during the second half of the course. By then, students will be familiar with microbiology, pathology and clinical scenarios. Prescriptions for common diseases, rational drug use and prescription audits form major part of the clinical pharmacology exercises. Students have shown enthusiasm and interest in these aspects as evidenced by their response (Table 3). Problem based learning is another well-known method of teaching clinical pharmacology.(18) Clinical case discussions, seminars, quiz and project work are included as group exercises in our practicals to impart skills in diagnosis and management of health issues.

Continuous updates are needed to improve education for a better healthcare. The medical education challenges also include shifting the importance from teachers as information providers to facilitators of learning. A teacher is supposed to function as a facilitator, while a student is supposed to be groomed as a lifelong learner. Seminars, project assignments and related sessions are designed to stimulate self-learning and to improve necessary clinical skills. Feedbacks from our students have indicated that these practical sessions were very useful in preparing them for future clinical practice. Preferences for these sessions were expressed as excellent/good (Table 4 and 5). Students have shown keen interest because these projects gave them a chance not only to absorb pharmacology knowledge but also to develop communication and presentation skills. They provided them an opportunity to express their talents, creative abilities and technological skills.

One of the reports of a survey of 60 medical graduates indicated that they acknowledge pharmacology as the most important second year subject.(19) However, they reported that the “pharmacology laboratories are most boring and least useful”.(19) There have been many attempts in the last two decades to change this situation.(20-22) The concept of personal (P) drugs, essential drug list and cost of therapy have been included as innovations in imparting knowledge on practical aspects of therapy.(23) In this study, students have rated their preference as good or excellent for many of the sessions(Figure 1).In addition, students have

indicated their appreciation as well as opinions for improvement.

Design and content of practicals assist the learning process of students. The exercises listed in this study play a vital role in developing observational and interpretive skills of students. Conducting seminars, clinical case discussions and group assignments require co-operation and dedication of faculty. Feedbacks about the practicals provide insights about students' perceptions and preferences. (13,16,17) Questionnaire based study has been used by various departments as a method of getting feedback.(18)The methods described in this study are easy to conduct, require minimal equipment and expenditure but provide valuable insights about students' perceptions and preferences.

## CONCLUSION

The skills and competencies required for a medical career can be imparted through different methods during the course of the study. Feedbacks from one batch of second MBBS students revealed the usefulness of different types of practicals in developing skills for clinical practice. Further, students have perceived the self-directed learning and group assignments related practical exercises as most useful and rated them highest. Practical exercises on basic pharmacology using CAL were also valued high. The information obtained from this study highlights the different structural and functional aspects of practicals that the students value and hence provide ample evidence to design interesting practical sessions in future.

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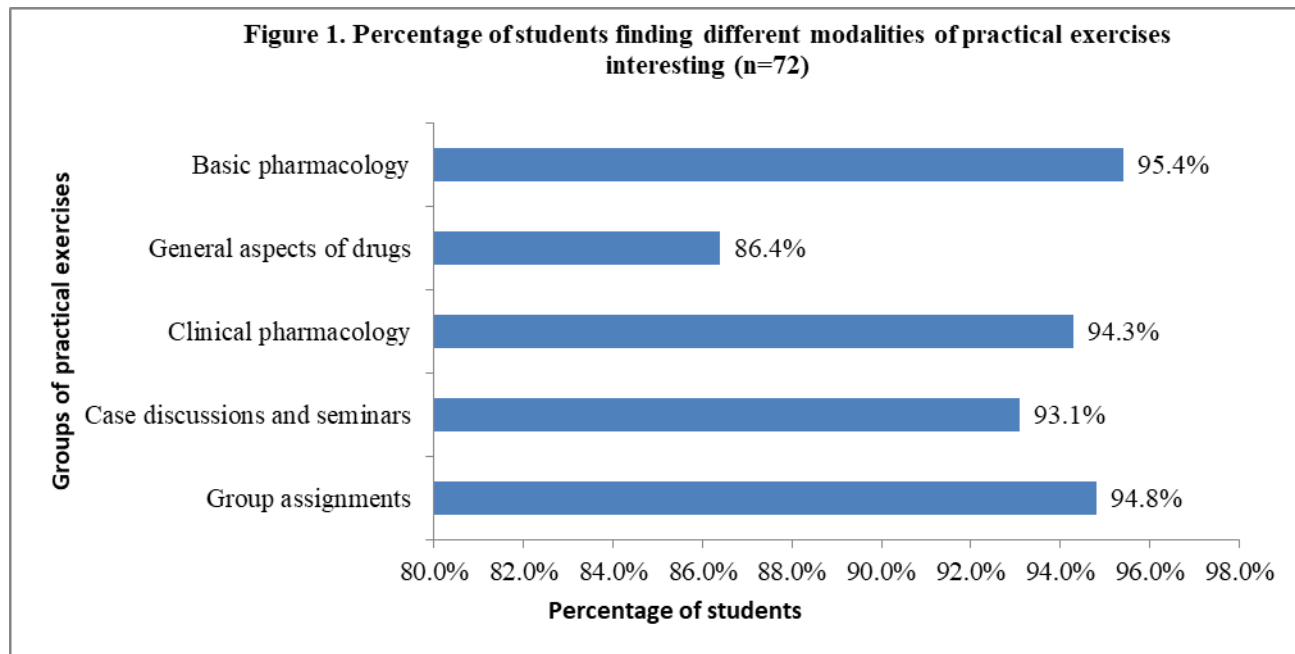
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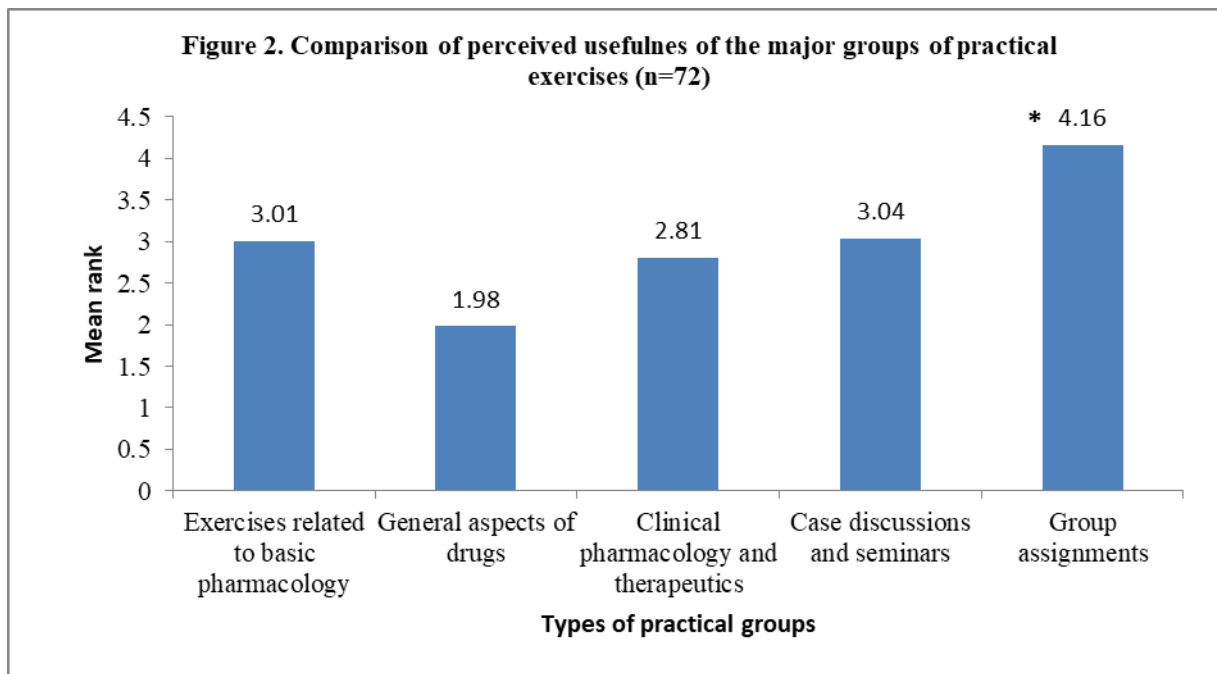
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**FIGURES:**





\* Friedman test  $P < .001$

## TABLES

**Table 1: Feedbacks on basic pharmacology exercises (Part A)**

Name of the exercises (n=72)	Rating of preferences for experiments on a scale of 1-5									
	Excellent (5)		Good (4)		Average (3)		Below average (2)		Least (1)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<b>1. Computer assisted learning Effect of drugs on isolated animal tissue preparations</b>	22	30.56	31	43.06	15	20.83	3	4.17	1	1.39
<b>2. Graphs: Discussion of agonist-antagonistic actions of drugs</b>	14	19.44	35	48.61	19	26.39	2	2.78	2	2.78
<b>3. Pharmacodynamics: Flow charts: Mode and site of action of drugs</b>	16	22.22	26	36.11	21	29.17	6	8.33	3	4.17
Average of preferences across different practical subtypes		<b>24.07%</b>		<b>42.59%</b>		<b>25.46%</b>		<b>5.09%</b>		<b>2.78%</b>

**Table 2: Feedbacks on general aspects of drugs (Part B)**

Name of the exercises (n=72)	Rating of preferences for experiments on a scale of 1-5									
	Excellent (5)		Good (4)		Average (3)		Below average (2)		Least (1)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<b>1. Nomenclature of drug</b>	11	15.28	22	30.56	28	38.89	8	11.11	3	4.17
<b>2. Sources of drug information</b>	10	13.89	20	27.78	31	43.06	7	9.72	4	5.56
<b>3. Dosage forms of drugs</b>	15	20.83	20	27.78	29	40.28	5	6.94	3	4.17
<b>4. Dosage calculations</b>	15	20.83	32	44.44	13	18.06	5	6.94	7	9.72
<b>5. Scanning of formulations</b>	9	12.50	27	37.50	24	33.33	3	4.17	9	12.50
Average of preferences across different practical subtypes	<b>16.67%</b>		<b>33.61%</b>		<b>34.72%</b>		<b>7.78%</b>		<b>7.22%</b>	

**Table 3: Feedbacks on clinical pharmacology exercises (Part C)**

Name of the exercises (n=72)	Rating of preferences for experiments on a scale of 1-5									
	Excellent (5)		Good (4)		Average (3)		Below average (2)		Least (1)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<b>1. Prescription writing</b>	20	27.78	38	52.78	8	11.11	4	5.56	2	2.78
<b>2. Prescription audit</b>	22	30.56	23	31.94	19	26.39	5	6.94	3	4.17
<b>3. Rational Use of drugs</b>	22	30.56	27	37.50	18	25.00	4	5.56	1	1.39
<b>4. Drug interactions - exercises on ADR</b>	30	41.67	30	41.67	8	11.11	1	1.39	3	4.17
<b>5. Problem solving exercises - Selection of drugs</b>	16	22.22	31	43.06	19	26.39	1	1.39	5	6.94
<b>6. Demonstration of devices - injections and insulin preparations</b>	25	34.72	18	25.00	21	29.17	4	5.56	4	5.56
<b>7. Pharmacoeconomics</b>	9	12.50	24	33.33	27	37.50	4	5.56	8	11.11
<b>8. Toxicology exercises</b>	16	22.22	27	37.50	19	26.39	7	9.72	3	4.17
Average of preferences across different practical subtypes	<b>27.78%</b>		<b>37.85%</b>		<b>24.13%</b>		<b>5.21%</b>		<b>5.04%</b>	



**Table 4: Feedbacks on case discussions and seminars (Part D)**

Name of the exercises(n=72)	Rating of preferences for experiments on a scale of 1-5									
	Excellent (5)		Good (4)		Average (3)		Below average (2)		Least (1)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<b>1. Seminars</b>	20	27.78	33	45.83	12	16.67	5	6.94	2	2.78
<b>2. Case discussions</b>	15	20.83	35	48.61	17	23.61	3	4.17	2	2.78
Average of preferences across different practical subtypes	<b>24.30%</b>		<b>47.22%</b>		<b>20.14%</b>		<b>5.55%</b>		<b>2.78%</b>	

**Table 5: Feedbacks on group assignments (Part E)**

Name of the exercises (n=72)	Rating of preferences for experiments on a scale of 1-5									
	Excellent (5)		Good (4)		Average (3)		Below average (2)		Least (1)	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
<b>1. Project work</b>	45	62.5	16	22.22	8	11.11	1	1.39	2	2.78
<b>2. Quiz</b>	40	55.6	22	30.56	7	9.72	1	1.39	2	2.78
Average of preferences across different practical subtypes	<b>59.03%</b>		<b>26.39%</b>		<b>10.42%</b>		<b>1.39%</b>		<b>2.78%</b>	

**Table 6: Friedman Statistical Test Parameters**

<b>N</b>	72
<b>Chi-Square</b>	73.409
<b>df</b>	4
<b>Asymp. Sig</b>	0