



# Study Through Memes: Using Memes as a Teaching Tool in Anatomy

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## ABSTRACT

**Introduction:** The popularity of internet memes these days, especially amongst young generation raises a question, whether memes can be used for enhancing interest and learning of students in lectures or not? This study shows the effectiveness of memes as a teaching tool in Anatomy subject.

**Aims and Objectives:** To determine the effects of using memes as a teaching tool in order to enhance interest and understanding of students.

**Place and Duration of study:** The study was conducted at Akhtar Saeed Medical and Dental College over 6 months duration between June to December 2023

**Material and Methods:** A group of 100 students was selected and divided into two groups. Both groups were taught using traditional method. A pre-experiment test related to musculoskeletal system was conducted. Then in revision classes the experimental group reinforced the concepts through power points presentations in which the memes were incorporated. A post experiment test of anatomy was taken from both groups A self-constructed survey was also conducted to register the students' experience regarding memes. Statistical analysis was done using SPSS version 27 paired T-test, for comparison of means in both groups pre and post experimental test scores . P value  $\leq 0.05$  was considered as significant.

**Results:** Results of the test taken before the experiment showed that students of both control and experimental group had equal level of understanding of the topic p value  $\leq .217$ , but the results of the pre and post experimental test of the experimental group showed significant difference. (P value  $\leq 0.018$ ) signifying their improved understanding of concepts. The survey results showed that memes can be used as a vector to enhance students' participation, interest, attention span and ability to memorize concepts.

**Conclusion:** Memes are an effective tool for teaching anatomy. Similar research can be done in other subjects too.

**Key Words:** Memes, regional anatomy, teaching methods

## INTRODUCTION

Term "meme" was first coined by Richard Dawkins in 1970 who suggested that memes are a unit of culture that can replicate, evolve, and be transferred from person to person just like genes<sup>1</sup>. The word has a Greek origin from word "mimema" which means being imitated. Meme is defined as an amusing or interesting item (such as captioned picture or video) or genre of items that spread widely online especially through social media<sup>2</sup>. A student is negatively affected because of high study load. Stress and depression are much higher in 1<sup>st</sup>

and 2<sup>nd</sup> year medical students as they find it difficult to adjust in the medical profession, with the passage of time they become emotionally intelligent and stable.

We are living in an era of digital world. Technology has taken charge of people's lives in such a way that they feel isolated from world without it. With the advent of internet and social networks like Twitter, Instagram, Facebook, TikTok; memes have become a popular way of contemporary social interaction and infotainment. Memes create a bond between individuals and cultural knowledge through social networks<sup>3</sup>. Today, memes are not only a source of humor but also used to draw attention of public in various sectors like political campaigning, marketing, pop-culture and computer science<sup>4,5,6</sup>. Memes can be used to deliver important messages in a humorous way. In a similar manner memes are also gaining academic interest<sup>7</sup>.

Teacher's face many challenges engage students and make difficult course digestible for students. For this purpose, they continuously try to find innovative and interesting methods like educational

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games, role-playing, problem based learning (PBL), mind maps, mnemonics etc. to boost attentiveness of students during lectures. Educational tools have also evolved during the last decade; Computers, tablets, smartphones, interactive whiteboards, e-books, and other electronic teaching tools have appeared. A study based in India showed how innovative teaching tools like voice threads, blogging, and podcast in classroom, social bookmarking screencast etc. can benefit both students and teachers<sup>5</sup>. With the digitization of education, memes can also be used as a source of humor to aid the learning process and increase the attention span of students. A study done by Purnama suggested that memes and Instagram can enhance students' participation<sup>6,8</sup>. Similarly a study done at the University of California on chemistry students established that mnemonic nature of memes can be used as a vector to reinforce complex concepts<sup>9</sup>. Bini, suggested that memes provide better opportunity for creative, challenging and participatory learning process<sup>10</sup>. Wells did an experiment using internet memes and deduced that this kind of activity can promote critical thinking in students<sup>11</sup>. In another research it was concluded that incorporation of memes in language class promotes students' proficiency level and helped them score higher in tests<sup>12</sup>. According to a study done by Mutua et al there was no discernible difference in students' math performance when math internet memes are included into the classroom<sup>12,13</sup>.

Anatomy is a very dry subject. Educators often face difficulty in maintaining interest of students and students also face difficulty in retaining difficult terminologies and concepts<sup>14</sup>. This article emphasizes on the use of memes as teaching tool for engaging students and effect of memes on understanding, attention span and knowledge retention in students of anatomy. In the previous decade, some researches have been done to explore the use of memes as an innovative teaching method<sup>12</sup>. Unfortunately, there is still limited data on the effectiveness of memes in educational settings, rather there is no such study regarding incorporation of memes in anatomy subject. we didn't find such studies in the literature which is the research gap addressed in the current study. Aim of this study is to establish the importance of using memes as a teaching tool in order to enhance interest and understanding of students.

## MATERIAL AND METHODS

A randomized controlled trial was conducted at Akhter Saeed Medical and Dental College, Lahore

in Pakistan over a 6-month duration between June and December 2023. Institutional permission was taken from IRB of institute prior to initiation (M-23-113). One hundred first year MBBS students, both male and female were included in the study after informed written consent. They were divided 50 each into a control and an experimental group, by balloting method at the start of musculoskeletal module.

In the musculoskeletal module of anatomy, the students of both groups were taught about the bones, muscles, nerves and arteries using traditional method of teaching the students as well as power point presentations, 3D models, dry bones and dissected cadavers. A pre-experiment test (Table-A) consisting of 15 questions one mark each from musculoskeletal module, for both groups was conducted before the start of experiment. The experimental group revised the concepts using the memes containing power point presentations to enhance the concepts while the control group revised the concepts by traditional method. At the end of experiment, a test of anatomy post experiment (Table-B) of both groups were conducted in order to assess the knowledge and understanding of students. Percentages of marks of both the tests of both groups were compared. Statistical analysis was done using SPSS version 27 paired T-test, for comparison of means in both groups pre and post experimental test scores. P value  $\leq 0.05$  was considered as significant.

| PRE EXPERIMENT ANATOMY TEST  |  |
|--|--|
| Questions  | Options  |
| 1. Angle of femoral inclination is   | a) 150°<br>b) 135°<br>c) 115°<br>d) 110°   |
| 2. Which of the following muscles is supplied inferior gluteal nerve?  | a) Gluteus maximus<br>b) Biceps Femoris<br>c) Gluteus Medius<br>d) piriformis  |
| 3. Structure passing below flexor retinaculum is   | a) Anterior tibial artery<br>b) Tibialis anterior muscle<br>c) Extensor hallucis longus tendon<br>d) Posterior tibial artery |
| 4. An unconscious patient needs Intravenous injection, the most common site to inject the medicine is  | a) Medial cubital vein<br>b) Median cubital vein<br>c) Lateral cubital vein<br>d) Axillary vein                              |
| 5. A 40 years old man after returning late at night fall asleep with arms by the side of chair causing wrist drop. The nerve most likely damaged was | a) Axillary nerve<br>b) Radial nerve<br>c) Musculocutaneous nerve<br>d) Median nerve   |
| 6. A patient presented with fracture of upper portion of humerus. The nerve to be injured is   | a) Axillary nerve<br>b) Ulnar nerve<br>c) Musculocutaneous nerve<br>d) Median nerve  |
| 7. In a roadside accident a person got fracture of medial epicondyle of humerus. The nerve to be   | a) ulnar nerve<br>b) median nerve<br>c) medial cutaneous nerve of  |

|  |   |
|--|---|
| injured was  | forearm<br>d) radial nerve  |
| 8. An old man falls on his shoulder resulting in a chipping off the lesser tuberosity of the humerus. The structure to be damaged is | a) Supraspinatus muscle<br>b) Infraspinatus muscle<br>c) Subscapularis muscle<br>d) Teres minor muscle  |
| 9. A 22-years old boy presented with swelling at elbow joint. The term student's elbow is used for                                   | a) Rupture of triceps tendon<br>b) Dislocation of superior radioulnar joint<br>c) Fracture of olecranon process of ulna<br>d) Inflammation of olecranon bursa |
| 10. The structure not forming boundaries of anatomical snuff box is  | a) Extensor pollicis brevis<br>b) Abductor pollicis longus<br>c) Abductor pollicis brevis<br>d) Styloid process of radius                                     |
| 11. Tendinous insertion of sartorius, gracilis, semi-tendinosus is called  | a) Genu varum<br>b) Genu valgum<br>c) Per anserinus<br>d) Plantar aponeurosis   |
| 12. Dislocation of lunate bone in wrist joint would most likely to compress which of the following structures?                       | a) Median nerve<br>b) Radial artery<br>c) Ulnar nerve<br>d) Ulnar artery  |
| Q13: Name branches of lateral cord of Brachial Plexus?   | Ans:  |
| Q14: Volkman's ischemic contracture occurs in supracandyle fracture of humerus is due to?  | Ans:  |
| Q15. What is piriformis syndrome?  | Ans:  |

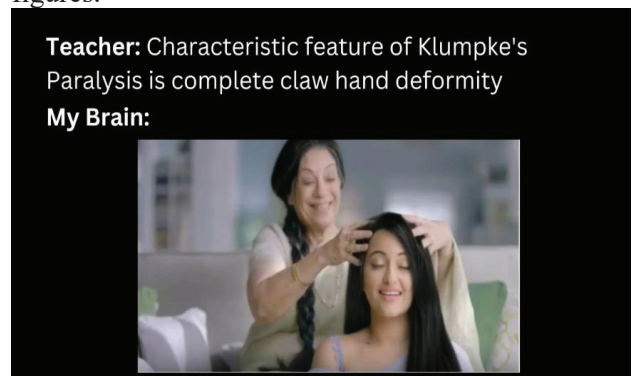
**Table-A: Pre Experiment anatomy test**

| POST EXPERIMENT ANATOMY TEST   |  |
|--|--|
| Questions  | Options  |
| 1.Nerve supply of Psoas Muscle is from nerve roots:  | a) L2, L3, L4<br>b) L1, L2, L3<br>c) T1 –T8<br>d) L3, L4, L5   |
| 2.Muscle Attachments on bicipital groove of humerus are:   | a) Trapezius, Latissimus dorsi, Subscapularis<br>b) Teres Major, Latissimus dorsi, Pectoralis Major<br>c) Teres Minor, Latissimus Dorsi, Subscapularis<br>d) Teres Minor, Teres Major, Trapezius |
| 3.A 15- year old boy had injury of arm. On examination he was unable to extend the wrist and fingers at meta-carpophalangeal joints i.e "Wrist drop". Which of the following nerves would most likely damaged? | a) Median nerve<br>b) Ulnar nerve<br>c) Radial nerve<br>d) Musculocutaneous nerve  |
| 4.Which of the following are the contents of femoral sheath?   | a) Femoral Nerve and Artery<br>b) Femoral Vein and Artery<br>c) Femoral nerve<br>d) Femoral Vein and Nerve   |
| 5.Supraspinatus is a part of rotator cuff muscles; it's main action is:  | a) Abduction<br>b) Internal Rotation<br>c) External Rotation<br>d) Circumduction   |
| 6. Following structures pass through lesser sciatic foramen except:  | a) Pudendal nerve<br>b) Internal pudendal vessels<br>c) Nerve and Tendon of Obturator<br>d) Sciatic nerve  |
| 7.Following muscles are supplied by radial nerve except  | a) Brachioradialis<br>b) Flexors of hand<br>c) Supinator<br>d) Triceps   |

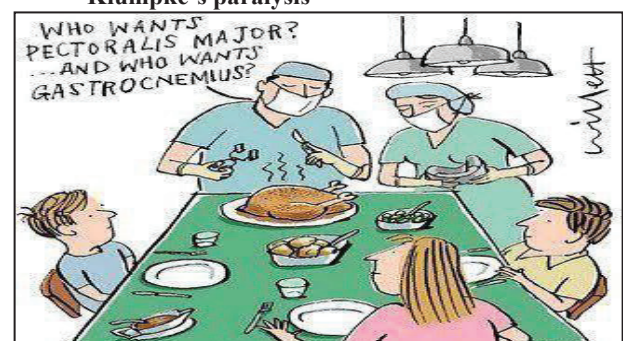
|   |   |
|---|---|
| 8.Muscle of calf that acts as peripheral heart is:  | a) Flexor pollicis brevis<br>b) Soleus<br>c) Flexor pollicis longus<br>d) Plantaris                     |
| 9.Following are Branches of thoraco-acromial artery except?   | a) Acromial Artery<br>b) Breast/Pectoral Artery<br>c) Clavicular Artery<br>d) Intercostal Artery        |
| 10.The condition in which angle of inclination between femur and hip-bone increases, knees become close and there is excess stress on lateral meniscus is called?   | a) Genu Valgum<br>b) Genu Varum<br>c) Articularis Genu<br>d) Genu Transversum                           |
| 11. A patient had Injury of hand, now he is unable to oppose his thumb and index finger. Which nerve is damaged?  | a) Ulnar nerve<br>b) Median nerve<br>c) Radial nerve<br>d) Posterior interosseous nerve                 |
| 12. A 25-year-old boy fell from cliff and grabbed a tree branch, now he has severe pain and immobility of arm, sensory loss along medial side of arm and complete claw hand. The above mentioned are features of which disease? | a) Erb's Paralysis<br>b) Dupuytren's contraction<br>c) Klumpke's Paralysis<br>d) Carpal Tunnel syndrome |
| 13.Name branches of posterior cords of brachial plexus?   | Ans:  |
| 14.Pes-anserinus is common tendinous insertion of which three muscles?  | Ans:  |
| 15.which structure is also referred to as "Funny Bone" and why?   | Ans:  |

**Table-B: Post Experiment anatomy test**

Note: The post experiment test questions were changed because the students had learned the pretest answers during the revision session. Therefore, new post test questions were given from the same module. Examples of a few memes are given below in the figures:



**Fig-1: Meme reinforcing concept of claw hand in Klumpke's paralysis**



**Fig-2: Meme showing the location of pectoralis major and gastrocnemius.**



Fig-3: Meme clearing the concept of the funny bone



Fig-4: Meme showing testing of anterior interosseous nerve OK sign.

A post experimental survey was conducted in the experimental group to assess the experience with and utility of memes (Table 1).

| Questions   | Responses  |
|---|--|
| Do you understand the term "Meme"?  | <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> </ul>  |
| Do you think memes can be used for teaching anatomy?  | <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Not Sure</li> </ul>  |
| Have you ever experienced memes in any classes before? If yes, explain how they were used and their effect on your education?         | <ul style="list-style-type: none"> <li>• Yes (to add humor)</li> <li>• Yes (educational; for better understanding of concepts)</li> <li>• Yes (to enhance memory/retention)</li> <li>• No</li> </ul> |
| Do you think memes have helped you memorize the concepts better?  | <ul style="list-style-type: none"> <li>• Strongly agree</li> <li>• Agree</li> <li>• Neutral</li> <li>• Disagree</li> <li>• Strongly Disagree</li> </ul>  |
| Do you think memes can be helpful in increasing attention span in lecture?  | <ul style="list-style-type: none"> <li>• Strongly agree</li> <li>• Agree</li> <li>• Neutral</li> <li>• Disagree</li> <li>• Strongly Disagree</li> </ul>  |
| Do you think incorporation of memes related to important concepts in lectures will increase interest or will it act as a distraction? | <ul style="list-style-type: none"> <li>• Increase Interest</li> <li>• Act as distraction</li> <li>• Neither</li> </ul>   |
| Did the memes help you answer questions in the test?  | <ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• To some extent</li> </ul>  |

Table-1: Survey regarding the memes

## RESULTS

Out of total 48 participants of the control group, 30 were female and 18 male. Whereas the experimental group had 28 female and 22 male participants. Age of participants ranged from 18-21 years. Results of the test taken before the experiment showed that students of both groups had equal level of understanding of the topic. The mean score of a pre-experimental test for control group is 10.25 with a standard deviation of 1.57 and that of experimental group is 10.17 with a standard deviation of 1.56. there was no statistical difference in means of pre-experimental results of two groups. P-value  $\geq .217$ . Table-2 & Table 4. The post experimental test also consisted of 15 Questions one mark each. In this test mean score of control group was 10.25 with a standard deviation of 1.74 which very close to pre-experimental test result of control group. Table-2

| Pair s    | Experimen-<br>tal Test<br>Results                                | Mea-<br>n | N  | Std.<br>Deviati-<br>on | Std.<br>Erro-<br>r<br>Mea-<br>n | P-<br>value |
|-----------|--|-----------|----|------------------------|---------------------------------|-------------|
| Pair<br>1 | Pre<br>experime-<br>ntal test<br>results of<br>Control<br>group  | 10.25     | 48 | 1.578                  | 0.228                           | 0.319       |
|           | Post<br>experime-<br>ntal test<br>results of<br>Control<br>group | 10.25     | 48 | 1.744                  | 0.252                           |             |

Table-2: Paired Samples Statistics (Control Group)

Experimental group had mean score of 11.04 with a standard deviation of 1.95. Paired t-test is applied to compare results of both control and experimental groups. P value is 0.983 which is not statistically significant. (Table-3). However, the results of the pre and post experimental test of the experimental group showed significant difference. (P value  $\leq 0.018$ ) shown in Table-4.

| Pair s    | Experimental<br>Test Results                                     | Mean  | N  | Std.<br>Deviation | Std.<br>Error<br>Mean | P-<br>value |
|-----------|--|-------|----|-------------------|-----------------------|-------------|
| Pair<br>1 | Post<br>experime-<br>ntal test<br>results of<br>Control<br>group | 10.25 | 48 | 1.744             | 0.252                 | 0.983       |
|           | Post<br>experime-<br>ntal test<br>results of<br>Case<br>group    | 11.04 | 48 | 1.957             | 0.282                 |             |

Table-3: Paired Samples Statistics

| Pairs  | Experimental Test Results                    | Mean  | N  | Std. Deviation | Std. Error Mean | P-value |
|--------|--|-------|----|----------------|-----------------|---------|
| Pair 1 | Pre experimental test results of Case Group  | 10.17 | 48 | 1.562          | 0.225           | 0.018   |
|        | Post experimental test results of Case group | 11.04 | 48 | 1.957          | 0.282           |         |

Table-4: Paired Samples Statistics (Study Group)

**Post experimental Survey results:**

43 out of 50 Experimental Group students participated. Results are shown in Table-5.

| Question 1.  | Yes                      | No                                       | Not sure                    |          |                   |
|--|--------------------------|--|-----------------------------|----------|-------------------|
| You understand the term meme   | 43 (100%)                | 0 (0%)                                   | 0 (0%)                      |          |                   |
| Question 2.  | Yes                      | No                                       | Not sure                    |          |                   |
| Do you think memes can be used in teaching anatomy?  | 36 (83.5%)               | 4 (9.5%)                                 | 3 (7%)                      |          |                   |
| Question 3.  | Yes to add humor element | Yes for better understanding of concepts | Yes to enhance memorization | No       |                   |
| Have you experienced memes in any lecture before   | 13 (30%)                 | 8 (18.5%)                                | 13 (30%)                    | 9 (21%)  |                   |
| Question 4.  | Strongly agree           | Agree                                    | Neutral                     | Disagree | Strongly disagree |
| Do you think memes have helped you memorize concepts better  | 13 (30%)                 | 20 (46%)                                 | 5 (11%)                     | 5 (11%)  | 0 (0%)            |
| Question 5.  | Strongly agree           | Agree                                    | Neutral                     | Disagree | Strongly Disagree |
| Do you think memes can be helpful in increasing attention span in lectures                                     | 20 (46%)                 | 18 (42%)                                 | 4 (9.5%)                    | 1 (2%)   | 0 (0%)            |
| Question 6.  | Increase interest        | Act as distraction                       | Neither                     |          |                   |
| Do you think incorporation of memes related to important concepts will increase interest or act as distraction | 36 (83.3%)               | 5 (11.2%)                                | 2 (4.1%)                    |          |                   |
| Question 7.  | Yes                      | No                                       | Not sure                    |          |                   |
| Did memes help you answer questions in quiz.   | 31 (72%)                 | 2 (4.5%)                                 | 10 (23.5%)                  |          |                   |

Table-5: Survey of Understanding, Experience & Impact of Memes in Experimental Group

**DISCUSSION**

The study's findings demonstrate the value of using internet memes in the classroom for educational purposes. It supports earlier research showing that using online memes as a multimedia resource enhances students' motivation, knowledge, excitement, and learning outcomes<sup>7,8</sup>. It is clearly evident from research findings that using internet memes in anatomy classroom is a creative, learner-centered approach. For the purpose of teaching and studying anatomy, a meme-aided classroom is better than a regular classroom<sup>9,10</sup>. There is no evidence in the literature that students were subjected to anatomy online memes. As a result, this study offers the novel conclusion that if learners are exposed to anatomical memes they are capable of learning through memes. Furthermore, the study's conclusions agree with earlier multimedia-based research that using multimedia tools can raise students' academic achievement<sup>6</sup>. Our study proves that comic nature of memes, relevance to modern technology and free access make them an excellent tool to enhance student participation. These findings are similar to findings of previous research<sup>16,17</sup>. All in all, this study shows that memes can be helpful in providing an enjoyable and beneficial learning experience.

**CONCLUSION**

This research has concluded that memes are effective tool for teaching anatomy. In this study memes were solely incorporated into lectures. However, research should concentrate on both the formation and interpretation of memes in order to provide a thorough assessment regarding the effect of the memes. Further research pertaining to internet usage will shed light on the long-term effects and consequences that might be anticipated as well as strategies for mitigating or preventing any detrimental effects on learning.

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