







## AN EXPERIMENTAL INVESTIGATION OF ANIMATED VIDEO BASED VISUAL LEARNING IN SPORTS EDUCATION

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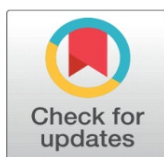
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## ABSTRACT

The purpose of this study was to examine the effect of animated video-based visual learning on student athletes enrolled in sport education programs. A pre-test and post-test control group experimental design was utilized for this study. Eighty (80) student-athletes (ages 18-24) enrolled in B. P. Ed. programs were selected for participation and were equally divided between an experimental (n = 40) and control Groups (n = 40). Sports education was measured by a 30-items Exercise Physiology Questionnaire, developed previously with CVR ranging from 0.62 to 1.00. The experimental group received an intervention consisting of eight (8) weeks of animated video-based visual learning with structured lessons covering the important information about Exercise Physiology while the control group did not receive any such intervention. To determine differences in pre and post-test scores within each group, dependent t-tests were conducted, and independent t-tests were conducted to compare post-test scores between the two groups. Statistically significant improvement in sports education was shown among student-athletes who received animated video-based visual learning as compared to those who did not ( $p < .01$ ). Statistically significant differences were also shown between groups in student-athletes, in that the experimental group outperformed the control group. Results from this study indicate that animated videos are an effective way to increase conceptual understanding in sports education through visual learning.

**Keywords:** Animated Videos, Student-Athletes, Exercise Physiology, Sports Education

## 1. INTRODUCTION

Student-athletes are frequently faced with the challenge of balancing academic responsibilities with athletic performance. Although physical education programs aim to develop both sports skills and theoretical knowledge, many student-athletes may find it difficult to grasp theoretical concepts due to factors such as time constraints, fatigue, or cognitive overload. These factors may negatively affect overall learning outcomes and understanding of theoretical concepts, which are important for success in both athletics and academics [Thompson et al. \(2024\)](#).

Recent advances in educational technology have demonstrated the potential for animated videos to serve as effective instructional tools [Höfler and Leutner \(2007\)](#). Animated videos can present complex or abstract information in a visual and engaging format, reduce difficulties in understanding complex theoretical concepts, and enhance retention of learned materials [Liu and Elms \(2019\)](#). Animated videos provide opportunities for self-paced learning, repeated practice, and interactive engagement, making animated videos especially suitable for student-athletes who need flexibility and efficiency in learning [Chao et al. \(2025\)](#).

Despite growing interest in visual and multimedia learning, there is limited empirical evidence systematically examining the effectiveness of animated videos as an instructional approach for student-athletes learning in physical education programs [Kao and Luo \(2020\)](#). Most quantitative studies in this area have focused on general student populations in traditional academic subjects and have provided limited evidence related to intervention studies for the distinct learning demands of student-athletes [Heo and Toomey \(2020\)](#).

Learning interventions are essential for assisting student-athletes as they navigate the conflicting demands of performing in sport and academics [Novan et al. \(2024\)](#). Conventional pedagogical approaches largely rely on lectures and textbooks. While this approach has value, it often fails to actively engage student-athletes or integrate diverse learning styles [Huang \(2005\)](#). Alternatively, instructional videos that leverage multimedia tools and animation can communicate complex constructs and ideas in a visual, interactive, and engaging manner [Lin and Dwyer \(2010\)](#).

Animation can illustrate complex topics simply, can highlight common themes and terms, and can demonstrate processes that would be hard to explain through the printed word [Sun et al. \(2025\)](#). Student-athletes benefit from a self-directed learning approach that encourages repetition and sustained engagement, which can again aid retention and understanding. Furthermore, while travelling for competitions, student-athletes often seek to utilize their time efficiently, and learning videos allow them to study without disruption. Student-athletes are always interested in utilising their time as efficiently as possible, and learning videos afford the opportunity to learn without delay and maximise those student-athletes' time that they have. In addition, animated learning videos encourage participation, engender engagement, and consider differing learning styles [Urquiza-Fuentes and Velázquez-Iturbide \(2013\)](#). For student-athletes who are often bound by a heavy training regimen, learning videos afford student-athletes flexibility and efficiency to build and strengthen their understanding of concepts while honouring their commitment to their sport. Overall, the integration of multimedia and animation into learning interventions not only improves student-athletes' overall academic performance but addresses the holistic development needs of student-athletes [Thomas et al. \(2025\)](#).

While animated videos have received significant attention in the general education context, there is very limited research directly examining students' learning experiences, including preferred learning styles and learning environments in physical education settings given the unique challenges such as limited time for study, intensive training schedules, and extensive traveling for competitions. This highlights the need for experimental studies that evaluate the effectiveness of animated learning videos in strengthening conceptual understanding among student-athletes, bridging the gap between theoretical knowledge and practical sports training [Ulfah et al. \(2025\)](#), [Barak et al. \(2011\)](#).

The objective of this study is to evaluate the effectiveness of self-constructed animated video-based learning in sports education. It aims to determine whether these videos can strengthen the conceptual understanding of student-athletes [Comeaux and Harrison \(2011\)](#). Additionally, the study examines whether the animated videos convey complex theoretical concepts to student-athletes more effectively than traditional instructional methods [Vacharathit et al. \(2015\)](#). It is anticipated that animated learning videos will positively influence the conceptual understanding of student-athletes [Cakiroglu and Yilmaz \(2017\)](#). Those who use these videos are likely to perform better in grasping complex theoretical concepts compared to student-athletes taught through traditional methods [Saeed and Zaman \(2024\)](#). Thus, the use of animated learning videos can potentially promote desirable learning outcomes among student-athletes [Osman and Lee \(2014\)](#).

## 2. METHODOLOGY

This was an experimental study to investigate the effect of animated video-based visual learning in sports education. The total sample of the study was 80 student-athletes aged 18 to 24 years from the B. P. Ed (Bachelor of Physical Education) program at Lovely Professional University, Phagwara, Punjab and Guru Nanak Dev University, Amritsar, Punjab. The sample was equally divided into experimental (N = 40) and control groups (N = 40). Participants had to be enrolled in sports education programs and had to compete at the national-level sports competitions.

The intervention consisted of a self-constructed animated video module delivered to B. P. Ed. student-athletes over 8 weeks, with 16 sessions conducted over two months. Each session lasted 30 minutes, and videos elaborated on key concepts in exercise physiology subjects using animated examples, demonstrations, and practical scenarios as shown in Table 1. The videos were structured to gradually develop conceptual understanding, starting with foundational topics and progressing to more complex applications over the two months. The experimental group received instruction through self-constructed animated video-based visual learning modules developed specifically for sports education concepts as shown in Figure 1. The video demonstrating the construction process is accessible online.

Figure 1

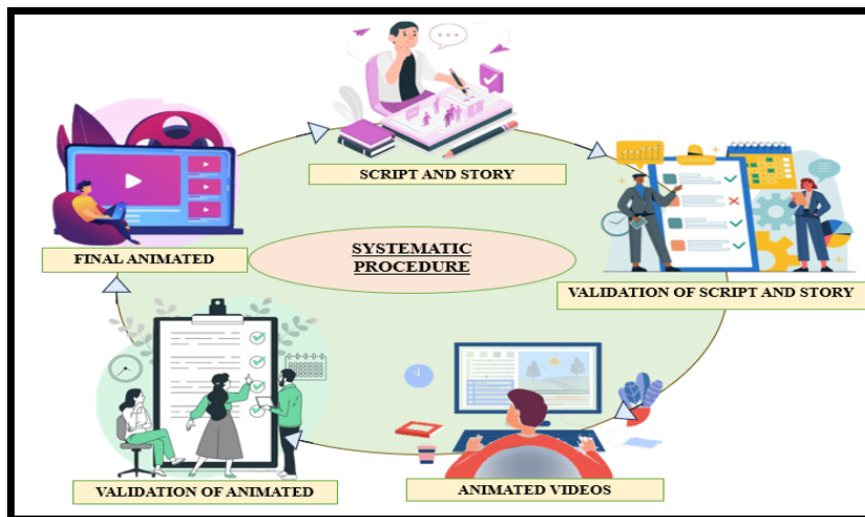


Figure 1 A Systematic Procedure for Developing Animated Videos (Click here).

Source: Developed by the Authors.

The sports education of participants was measured using self-developed Exercise Physiology Questionnaire (EPQ) for B. P. Ed. student-athletes. Questionnaires were evaluated for face and content validity by a panel of 10 Physical Education experts. Content validity was assessed using Lawshe's Content Validity Ratio (CVR), retaining only items with  $CVR \geq 0.62$ . For the EPQ, all retained 30 items had CVR values ranging from 0.62 to 1.00, resulting in a Content Validity Index (CVI) of 0.93. These validated questionnaires provide reliable and expert-approved measures of sports education in exercise physiology.

Table 1

Table 1 Animated Video Intervention Program.

Week	Session	Duration (min)	Topic covered	Video description
1	1	30	Meaning of exercise physiology	Elaborate meaning and definition with animated examples
1	2	30	Importance of Exercise Physiology	Elaborate on the Importance and benefits of Exercise Physiology with animated characters
2	3	30	Skeletal system	Describing the role of Skeletal system and bones in sports with animated video presentation for better understanding
2	4	30	General Structure of the bone	Different types of bones, and their important functions in sports with animation views

3	5	30	Joints and their Structure	Demonstrate different types of joints and their movement with Animated visuals.
3	6	30	Meaning and structure of muscles	Elaboration various types of muscles and their functions with animation visuals
4	7	30	Contractions of Muscles	Understanding the types of muscles during sports activity Easy understand with gym videos
4	8	30	Structure of digestive tract	An animated video with vibrant colours and the camera zooms in to reveal a human figure representing an athlete
5	9	30	Digestion of food	Action of various enzymes on food, and how it relates to sports with colourful animated depiction of the human digestive system
5	10	30	Digestion of food, action of various enzymes on food	Breakdown of food and enzyme action, including amylase, pepsin, trypsin, and lipase, in different digestive organs
6	11	30	Structure of respiratory organs	Anatomy of the respiratory system, including the lungs, trachea, bronchi, and alveoli, using labelled 2D animations and real-life breathing visuals
6	12	30	Internal and external respiration	Processes of gas exchange, highlighting oxygen and carbon dioxide movement in internal (cellular level) and external (lungs and blood) respiration
7	13	30	Circulatory System	Heart structure and blood circulation animation
7	14	30	Blood and Its Components	Blood cells and their functions through animation
8	15	30	Energy Systems in Sports	Aerobic and anaerobic energy systems visualized
8	16	30	Fatigue and Recovery	Recovery processes and fatigue mechanisms using animation

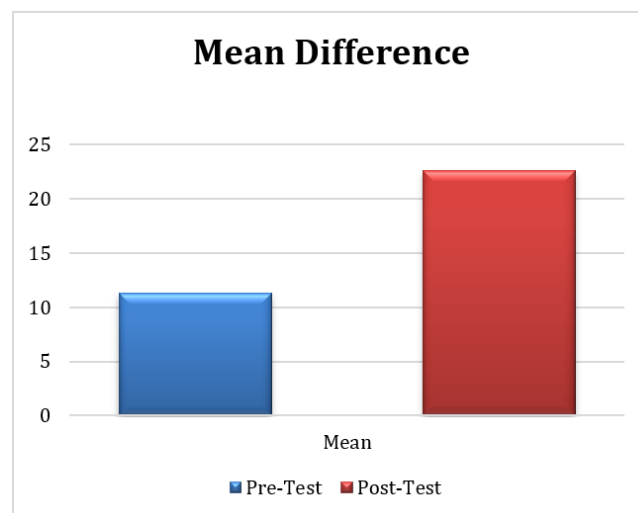
### 3. RESULTS AND DISCUSSION

This section provides results of the study that looked at the impact of animated video-based visual learning on student-athletes' sports education. To compare the change in scores from pre-test to post-test for each group, dependent t-tests were applied within groups. Independent t-tests were used to compare the average post-test scores of the experimental and control groups.

**Table 2**

Table 2 Shows the Effect of Animated Videos on the Sports Education of Student-Athletes in the Experimental Group					
Experimental Group	N	Mean	S. D.	df	t
Pre-Test	40	11.28	4.08		
Post-Test	40	22.60	4.08	39	9.42**

**Figure 2**



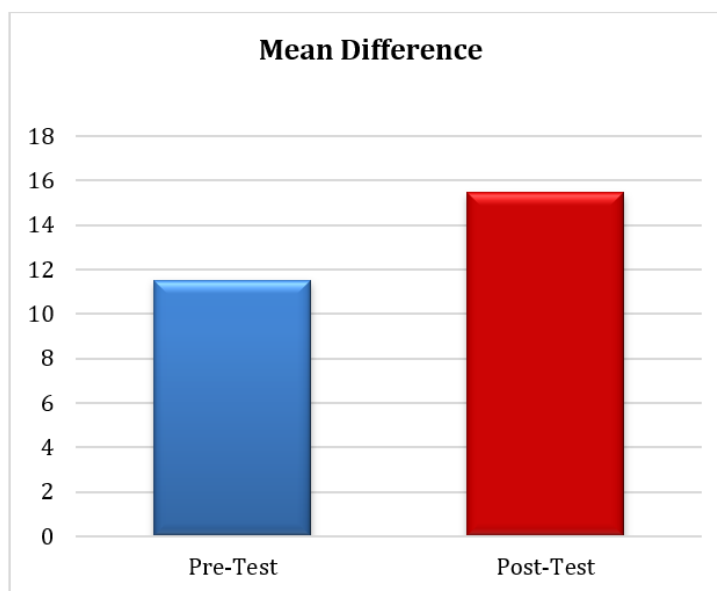
**Figure 2** Shows the Mean Values of Student-Athletes in the Experimental Group

Table 2 and Figure 2 Show the effect of the animated videos on the sports education of student-athletes of experimental group. In the pre-test mean score of sports education (exercise physiology) of student-athletes from experimental group was 11.28 out of 30 marks with a standard deviation of 4.08, while in the post-test mean score was 22.60 out of 30 marks with a standard deviation of 4.08. The t-test shows significant difference of ( $t = 9.42$ ). The result was statistically showed highly significant at 0.01 level. The result was showed that the animated videos substantially improved the sports education (exercise physiology) of B.P.Ed. student-athletes, with an increase of 11.32 marks from pre-test to post-test.

**Table 3**

Table 3 Shows the Effect of the Animated Videos on the Sports Education of Student-Athletes from Control Group.					
Control Group	N	Mean	S. D.	df	t
Pre-Test	40	11.50	4.20		
Post-Test	40	15.45	4.45	39	3.82**

**Figure 3**



**Figure 3** Shows the Mean Values of Student-Athletes in the Control Group

Table 3 and Figure 3 Show the effect of the animated videos on the sports education of student-athletes of control group. In the pre-test mean score of sports education (exercise physiology) of student-athletes from control group was showed 11.50 out of 30 marks with a standard deviation of 4.20, while in the post-test mean score 15.45 out of 30 marks with a standard deviation of 4.45. The t-test shows significant difference of ( $t = 3.82$ ). The result was statistically showed significant at 0.01 level, indicating that conventional teaching methods led to a modest improvement in sports education. However, the magnitude of improvement was considerably lower than that observed in the experimental group.

**Table 4**

Table 4 Shows the Difference in the Post-Test of Sports Education Between Student-Athletes of Experimental and Control Groups					
Group	N	Means	S. D.	df	t
Experimental	40	22.60	4.08		
Control	40	15.45	4.45	78	7.26**

Figure 4

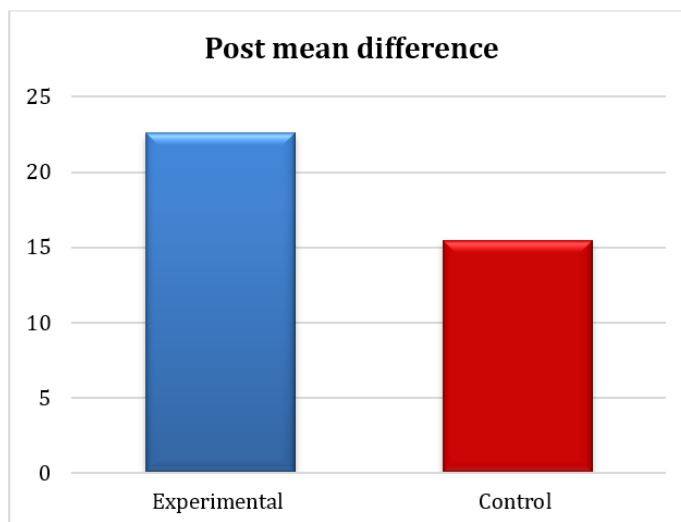


Figure 4 Shows the Post-Test Mean Values of Experimental and Control Groups

Table 4 and Figure 4 Show the difference in the post-test of sports education (exercise physiology) between student-athletes of experimental and control groups enrolled in the B. P. Ed. program. In the post-test mean score of conceptual understanding of the experimental group was showed 22.6 (75.33 %) out of 30 marks with a standard deviation of 4.08, while in the post-test mean score of conceptual understanding of control group 15.5 (51.66 %) out of 30 marks with a standard deviation of 4.45. The independent t-test shows significant difference of ( $t = 7.26$ ). The result was statistically showed highly significant at 0.01 level (table value = 2.71). The results showed that the animated learning videos substantially improved the conceptual understanding of experimental group as compared to control group B.P.Ed. student-athletes, with an increase of 7.15 marks (23.67 %) from post-test of experimental group. This clearly indicates that the animated videos are effective in enhancing sports education (exercise physiology).

The findings of this study demonstrate that the animated videos significantly enhanced the sports education (exercise physiology) of student-athletes. Animated videos are helpful because they simplify complex concepts into clear visual sequences, capture learners' attention, and enhance memory retention [Utaminingsih et al. \(2024\)](#). For student-athletes who often struggle to balance demanding training schedules with academic studies, animated videos provide an engaging and less stressful way to understand theoretical content, which ultimately leads to better learning outcomes [Ifenatuora et al. \(2024\)](#), [Maulana \(2024\)](#). In comparison to study on the effectiveness of using animation media on understanding meaning through the implementation of contextual learning, the pre-test score on Arabic learning was 67.51 and post-test 77.91, the score was increased by 10.40. This comparison indicates that the animated learning videos produced substantial measurable effects in the present study, with a larger absolute change observed in conceptual understanding among student-athletes compared to the improvement in adaptive behaviour [Febriani et al. \(2024\)](#).

The experimental group of student-athletes showed better improvement in their sports education. The animated videos explained the concepts in an easy, step-by-step manner, which helped the learners to remember and apply the knowledge more effectively. Student-athletes usually face difficulties in managing time for study because of their training schedules, but the animated lessons made learning more engaging and less stressful [Lamban et al. \(2025\)](#). This extra support created interest and clarity, which reflected in their higher post-test scores. On the other hand, the control group did not receive any such support and therefore their performance remained comparatively low. The difference between the two groups highlights the importance of animated learning videos in making learning simple, interesting, and effective. Thus, animated learning videos also help in managing the dual career performance of elite student-athletes by supporting both their academic achievements and sports excellence. Many athletes often struggle with low conceptual understanding due to their rigorous training schedules, national camps, and international competitions. Since adequate educational facilities are generally not provided by the government during these camps, their studies suffer alongside sports commitments. By integrating animated learning videos, athletes can simultaneously manage their conceptual understanding with their sporting responsibilities, ensuring balanced growth in both areas. In comparison to the study on the effect of using animation media on students' physics learning outcomes in linear motion material, where the

experimental class improved from a mean increase from pre 6.88 to post 10.24 with an increase of 3.36 score (42.2%), while the control group mean of pre 6.57 to post 7.2 with an increase of 0.63 score, which supports to the present study on student-athletes reported higher conceptual understanding [Nurnaifah et al. \(2024\)](#).

#### 4. CONCLUSION

This study concludes that animated videos have significant value in enhancing conceptual understanding for student-athletes. The results, obtained through validated instruments and statistical analysis, showed that the intervention had a significant positive effect on sports education in the academic area of exercise physiology. The animated videos provided a structured, visually rich way of clarifying concepts in a way that enabled learners to make connections between the theory and their sporting practice.

The study demonstrates the value and importance of introducing technology-enhanced instructional media into sports education, especially when teaching students who need to juggle their rigorous athletic training and competition with challenging academic workloads. Animated videos can not only support student-athletes in understanding complex concepts but also engage them in a deeper and more meaningful learning experience that can lead to long-term understanding.

This study illustrates the value of utilizing innovative digital learning resources to improve academic outcomes for student-athletes. Thus, a pathway exists for educators and curriculum developers to explore using a similar approach to create individualized learning experiences that make the learning process of conceptual development more structured, interesting, and ultimately consequential for future cohorts of student-athletes.

#### CONFLICT OF INTERESTS

None.

#### ACKNOWLEDGMENTS

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