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Examining Shoulder Injuries and Fractures in Athletes Utilizing Convolutional Neural Networks (CNN)

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Abstract:
The prevalence of sports injuries has increased in recent times, mostly attributed to the growing enthusiasm for various sports disciplines. Physical harm may manifest in any region of the human anatomy. The consideration of sports injuries is of utmost importance, taking into account both the future of the sportsmen and the field of medicine. The objective of this study is to investigate shoulder injuries and treatment approaches specifically related to upper extremity injuries in athletes. Additionally, the study intends to provide practical applications based on the researchers' findings. The intricate anatomical composition of the shoulder joint, along with its extensive use, creates a predisposition for injury. There are several conservative and surgical approaches available for treating shoulder problems. While some treatments, such as physical therapy and injections, have been widely accepted, others have gained significant popularity in recent years. The researchers conducted a clinical study on 204 athletes who were suffering from different shoulder issues. They utilized surgical interventions and physiotherapy techniques, along with injections, to treat these patients. As a result, the athletes were able to resume their sports activities within a short period of time. This research elucidates the techniques used to expedite the return to sports within a brief timeframe.

Keywords: Athletes. Sports. Upper Extremity. Method. Shoulder. Treatment

INTRODUCTION

Sports injuries occur when the tissues of the body or a specific body component are subjected to a force that exceeds their endurance limit. According to this concept, sports injuries may occur in individuals who do not engage in sports activities (Diniz and Ketenci 2000: 377; Imren 2010:6; Erol and Karahan 2006; Uslu 2005). The phrase "sports injuries" refers to a wide range of injuries that arise during the practice of sports activities (Hasçelik 2007). These types of injuries arising from physical activity inside the body might occur for several causes.
A sports injury is an occurrence that happens when participating in sports and has the following effects: a) It leads to a decrease in the level and intensity of sports activity. b) It requires medical advice or treatment. c) It has adverse social and economic consequences.
Sports injuries include not just injuries caused by external elements or forces during sports activities, but also injuries that arise from the body's own internal mechanisms. These damages are caused by physical activities that might occur for numerous causes (Sakal-li 2008: 144; Imren 2010: 6).
There are several forms of injuries associated with different sports (Önçag et al. 1998: 122). According to Groh, the likelihood of sustaining an injury among those who participate in sports is 1 in 4,000. The fatality rate is 1 in 40,000, and the possibility of encountering a major accident is 1 in 40. In addition, it was determined that the sporting disciplines with the highest incidence of sports injuries include football (10%), wrestling (6%), handball (3%), boxing (3%), athletics (1%), and skiing (0.5%). Spinal cord injuries mostly arise from diving (21.6%) or skiing (13.4%). According to Sakalli (2008: 148), the sports that follow in terms of popularity are football (12.7%), rugby (10.6%), American football (9.4%), air sports (7%), judo (6.8%), and gymnastics (6.6%). Sports injuries may be classified as primary injuries, which are caused directly by exposure to sports stress, and secondary injuries, which develop as a consequence of earlier injuries (Aydin 2006: 11). Commonly encountered issues include strain (injury to the musculotendinous structure), sprain (injury to the ligaments at varying degrees), subluxation dislocation, muscle or tendon ruptures, fractures, hemarthrosis, synovitis, tendinitis, bursitis, and overuse syndromes (injuries resulting from repeated submaximal overload or friction forces).
These issues may occur from the physical activity carried out in daily life and also from specific sports activities (Sakalli 2008: 144). Tissue injury may develop spontaneously in contact sports, and in endurance sports it may result from a combination of various factors. These variables contribute to the likelihood of injuries happening

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(Aydin 2006: 11). The elements may be categorized into two groups: intrinsic factors, which are personal or individual in nature, and extrinsic factors, which are environmental in nature (may 1997: 15). Intrinsic factors refer to the personal characteristics and qualities that are linked to the athlete. It constitutes 40% of these elements. The following items are:
1. Age and gender are factors to consider. 2. Anatomic issues such as joint limitation or loss of joint mobility range may develop later. 3. Previous untreated injuries might contribute to the problem.
4. Physical limitations, such as muscular weakness or insufficient muscle flexibility, caused by previous injuries and inadequate exercise.
5. There is a discrepancy in strength between the muscles that act as agonists and those that act as antagonists.
6. Exhaustion and excessive use
7. Inadequate warm-up and poor physical conditioning
8. Muscle rigidity caused by intense physical exertion or illness (Uluöz 2007: 23-24).
The extrinsic elements, often known as environmental factors, may be listed as follows:
1. Errors that occur during training.
2. Inappropriate training methods
3. Factors associated to sports
4. Sporting venues or locations 5. Sporting equipment utilized 6. Climatic factors such as temperature, humidity, and wind 7. Instructor or mentor who guides and trains athletes
8. Match management, which includes match regulations and referees, is discussed by Imren (2010:7).
The causes of sports injuries may be enumerated as follows:
1. Exhaustion, excessive use
2. Previous and incompletely resolved injuries
3. Cold-induced muscle and joint stiffness
4. Overly extensive stretching and infection
5. Muscle weaknesses stemming from previous injuries or insufficient knowledge
6. Muscular asymmetry
7. Insufficiency of the sports equipment 8. Inadequate physical readiness 9. Insufficient warm-up 10. Incompatibility between the person and the sports activity 11. Lack of proper technique
12. Lack of psychological preparedness 13. Intense competition
14. The correlation between competitive sports and illnesses (Uslu, 2005 as referenced by Sakalli, 2008).

Upper limb injuries
Athletes often have upper extremity injuries. Although there is no exact data available for Turkey on this matter, it is estimated that between 1.9 to 2.5 million athletes seek emergency medical attention each year in the USA owing to injuries to their upper extremities (Durmaz 2006: 18). Inevitably, if an individual's muscles and ligaments are weak, they are certain to get an injury when engaging in sports. The upper extremity complex consists of bonds, cartilage structures, muscles, and tendons. During everyday activities and sports, the upper extremity complex experiences excessive strain within its physiological and biomechanical constraints. Sports injuries occur when the amount of stress placed on the body exceeds its physiological and biomechanical capabilities, causing the upper extremity complex to be unable to cope with the demands.

Fig. 1. Direct radiographic image of a patient we treated due to clavicle fracture

Frequently observed in upper extremity regions are injuries such as shoulder and acute shoulder injuries, elbow and acute elbow injuries, acromioclavicular sprains, clavicle fractures (Fig. 1), and glenohumeral dislocations (Kocher et al. 2000; Nowak et al. 2000; Lawton et al. 2002; Nichols 1996, as cited in Sakalli 2008:144). The shoulder joint is where most upper extremity injuries occur. At first, it presents as shoulder dislocation. It is important to assess the presence of a fracture in cases of shoulder dislocations (Brewin et al., 2000; Yildiz and Göçgeldi, 2002). Several studies have shown that excessive strain on the shoulder raises the likelihood of ligament and muscle injury, as well as increased discomfort in this area (Brüggeman 1994; Caraffa et al. 1996; Nissinen 1995 as cited in Sakalli 2008: 144-154).

Upper extremity injuries often result from either falling onto an extended hand or experiencing direct impact. These sports, including football, volleyball, handball, tennis, swimming, and gymnastics, are where they are most often seen. The upper extremities may be categorized into the following sorts of injuries.

Shoulder Injuries and Treatment Methods

The problems seen in the shoulder region are problems associated with instability (shoulder dislocation, subluxation), rotator cuff lesions and tendon rupture (Fig.2).

Fig. 2. Direct radiographic image of our athlete patient with glenohumeral joint anterior luxation

Rotator Cuff Tear

"Rotator cuff" rips may occur suddenly in contact sports, whereas they are often chronic injuries that affect the supraspinatus muscle (Doral, www.nuveforum.net). An intact rotator cuff is essential for the optimal functioning of the shoulder joint. The rotator cuff exerts three primary impacts on the shoulder. These actions include applying pressure on the humeral head against the glenoid, resulting in increased contact pressure inside the joint and directing the humeral head towards the center of the glenoid (Bassett et al. 1990: 405-415). The deltoid muscle facilitates shoulder abduction by synergistically interacting with the supraspinatus and infraspinatus muscles (Bechtol 1980: 37-41; Chen 1994: 165-169; Cotton 1964: 314-328; Deutsch et al. 1996: 186-193 referenced in Bezer et al. 2006). During the first phase of abduction, the deltoid muscle exerts a vectorial force that causes the humeral head to move higher. The rotator cuff exerts a counteracting force to prevent the glenoid from moving upwards (Akpinar et al., 2003: 4-12). When there is a rupture in the rotator cuff and weakness, the humeral head moves upward during abduction because the tension exerted by the deltoid muscle is not balanced (Gerber and Krushell 1991: 389-394 as cited in Bezer et al. 2006).

The performed vascular tests demonstrated that there is an avascular region known as the "critical zone" positioned 1-2 cm proximal to the attachment site of the supraspinatus tendon to the tuberculum majus, which is susceptible to degeneration. The repetitive upward and outward movement of the arm results in reduced blood flow in this area, causing inflammation and tendinitis (Frieman et al. 1994: 604-609 cited in Kelle and Kozanoglu 2013). Repeated episodes of reduced blood flow and inflammation lead to the deterioration of the rotator cuff. Degenerated rotator cuff tendinitis is characterized by abnormalities in blood vessels and fibroblasts, infiltration of glycosaminoglycans, and transformation into fibrocartilage.

The supraspinatus, infraspinatus, teres minor, and subscapularis muscles are responsible for shoulder rotation. They are referred to as the rotator cuff muscles because they encircle the shoulder like a waistband.

Chronic rotator cuff degeneration is characterized by the presence of an osteophyte on the lower anterior aspect of the acromion, as well as the probable development of arthrosis in the acromioclavicular joint and narrowing of the subacromial space. It indicates a tear that is less than 6 mm. MRI is more effective than arthrography in diagnosing full tears, but it is less reliable and challenging to interpret when evaluating partial tears. Arthroscopy is especially advantageous for assessing instability and may be used to estimate the size of a preexisting rotator cuff injury (Dalton 1994: 1-16).
The treatment approach is mostly conservative. Corticosteroid injection is not advised within 4-6 weeks after an acute injury. The treatment decision for individuals with a complete tear depends on their age, level of physical activity, and the severity of the damage. It is advisable to do surgery on young and physically active individuals with acute rupture as soon as possible. Should the elderly and less physically active individuals fail to show improvement with the conservative therapy administered every three months, it is advisable to consider subacromial decompression and primary repair as alternative options. In cases of chronic total tear, the primary surgical justification is the continued presence of discomfort. Cuff debridement is carried out using a surgical method, as described by Dalton (1994: 1-16, cited in Saglam 2004).

Dislocation of the shoulder

Shoulder dislocation is the second most often seen dislocation, occurring after mild and moderate dislocations in the joints between the fingers of the hand (Fig. 3). Shoulder dislocation, commonly observed in individuals aged 20-25 who have sports-related injuries, has a recurrence rate of 55-95% depending on the extent of permanent damage to the surrounding soft and bony tissues of the joint (Salciet al. 2007: 46-47).

Fig. 3. Shoulder dislocation

It may occur as a result of actions like tossing, lifting, striking, and spinning in sports such as American football, wrestling, football, or basketball, where the likelihood of impact is significant (Griffith 2000: 308 cited in Imren 2010). The prevalence of anterior instability is high. Recurrence is quite probable in people who had anterior shoulder dislocation during their early years. Hence, therapy is important. Early reduction is necessary in cases of acute dislocations. Shoulder dislocations may be characterized as either traumatic or atraumatic. Atraumatic dislocations tend to respond well to physical therapy and conservative treatment approaches. Although acute dislocations have a significant risk of recurrence, the decision to pursue therapy should be carefully evaluated and tailored to the individual patient. There is no necessity for immobilization that prolongs after the second dislocation in their existing situation. It is crucial to enhance the strength of the rotator cuff and periscapular muscles. Acute subluxation may present as a sudden and intense discomfort during external rotation, referred to as "Phomopsis viticola". This condition may lead to impaired arm control and reduced capacity in affected persons. Posterior instabilities primarily manifest as subluxation. The majority of them are non-traumatic and occur as a consequence of repetitive microtraumas. They have a favorable response to the assertive physical treatment. The key discoveries in multidimensional instabilities are increased joint volume and laxity.

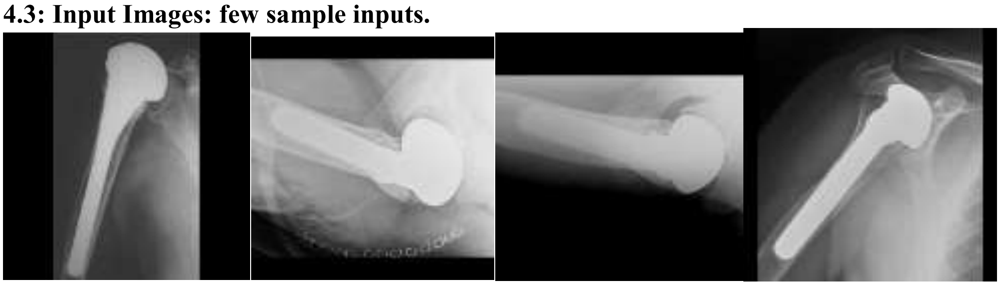
Athletes have a sense of looseness and soreness in their shoulder region. During the physical examination, laxity is seen in all directions, but the most significant aspect is the presence of inferior laxity. Additionally, a cavity forms in the lateral shoulder when the arm is dragged downwards. The term for this is known as the Sulcus sign (Doral www.nuveforum.net).Bilateral anterior shoulder dislocation is an uncommon occurrence that is often caused by convulsions associated with epilepsy, electrical shock, alcohol withdrawal, and hypoglycemia. These conditions lead to sudden and intense muscular contractions. Other factors that might contribute to injuries include weight lifting, diving, and traction injuries. The dislocation mechanism involves the humerus leaning on the tuberculum majus acromion due to forceful abduction and external rotation, resulting in the creation of a lever arm impact.In most cases, tuberculum majus fractures that occur with anterior shoulder dislocation are managed by conservative therapy (Cottias et al. 2000: 95-97 as cited in Bostan et al. 2011: 247-250). The objective of surgical therapy is to decrease the size of the tuberculum majus, avoid posterosuperior displacement, and limit abduction and external rotation to prevent the establishment of impingement syndrome. Furthermore, comparable outcomes were achieved in instances when solitary tuberculum fractures were managed conservatively, as well as in cases of conservatively treated shoulder dislocations with accompanying tuberculum majus fractures. Nevertheless, it is crucial to thoroughly assess each patient and choose the suitable therapy by considering all the characteristics of the patient (Bostan et al. 2011:247-250). Consequently, these fractures and dislocations may be effectively treated using conservative methods, which include doing a thorough radiological assessment before and after the reduction procedure, along with a careful maneuver to realign the bones.

MRI CODE FOR SHOULDER FRACTURE

```
from __future__ import print_function, division
import os
import time
import copy
import numpy as np
import matplotlib.pyplot as plt
from get_metrics import * plt.ion()
import torch
import torchvision
import torch.nn as nn
import torch.optim as optim
from torch.optim import lr_scheduler
from torchvision import datasets, models, transforms
ROOT = 'mura_clahe'
data_dir = os.path.join(ROOT, 'mura')
images_dir = os.path.join(data_dir, 'images')
train_dir = os.path.join(data_dir, 'train')
val_dir = os.path.join(data_dir, 'val')
pretrained_stds= [0.229,0.224,0.225]
batch_size=8
data_transforms = {
  'train': transforms.Compose([
    transforms.Resize((pretrained_size,pretrained_size)),
              transforms.RandomHorizontalFlip(),
              transforms.RandomRotation(10),
              transforms.ToTensor(),
              transforms.Normalize(mean = pretrained_means,
                                   std = pretrained_stds)
  ]),
  'val': transforms.Compose([
    transforms.Resize((pretrained_size,pretrained_size)),
              transforms.ToTensor(),
              transforms.Normalize(mean = pretrained_means,
                                   std = pretrained_stds)
  ]),
         }
print("Initializing Datasets and Dataloaders...\n")
# Create training and validation datasets
image_datasets = {x: datasets.ImageFolder(os.path.join(data_dir, x), data_transforms[x]) for x in ['train', 'val']}
# Create training and validation dataloaders
dataloaders = {x: torch.utils.data.DataLoader(image_datasets[x], batch_size=batch_size, shuffle=True,
num_workers=4,pin_memory=True) for x in ['train', 'val']}
```

```
device = torch.device("cuda:0")
dataset_sizes ={x:len(image_datasets[x]) for x in ['train','val']}
# Class names convert to index
image_datasets['train'].class_to_idx
class_names=image_datasets['train'].classes
print(">>Class Names: {}\n".format(image_datasets['train'].classes))
print(">>Class Index: {}\n".format(image_datasets['train'].class_to_idx))
print(">>Number of images in training={}\n".format(dataset_sizes['train']))
print(">>Number of images in test={}\n".format(dataset_sizes['val']))
print("    Number of steps for training set={}\n".format(len(dataloaders['train'])))
print("    Number of steps for test set={}\n".format(len(dataloaders['val'])))
# 1:positive #0:negative
train_losses = []
train_acc = []
val_losses = []
val_acc = []
def train_model(model, criterion, optimizer, scheduler, num_epochs):
    since = time.time()
    best_model_wts = copy.deepcopy(model.state_dict())
    best_acc = 0.0
    ghost=True
    for epoch in range(num_epochs):
        print('Epoch {}/{}'.format(epoch, num_epochs - 1))
        print('-' * 10)
        # Each epoch has a training and validation phase
        for phase in ['train', 'val']:
            if phase == 'train':
                model.train()  # Set model to training mode
            else:
                model.eval()   # Set model to evaluate mode
            running_loss = 0.0
            running_corrects = 0
            # Iterate over data.
            for inputs, labels in dataloaders[phase]:
                inputs = inputs.to(device)
                labels = labels.to(device)
                # zero the parameter gradients
                optimizer.zero_grad()
                # forward
                # track history if only in train
                with torch.set_grad_enabled(phase == 'train'):
                    outputs = model(inputs)
                    #outputs,aux= model(inputs) only for ınception network
                    _, preds = torch.max(outputs, 1)
                    loss = criterion(outputs, labels)
```

4.3: Input Images: few sample inputs.



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Developing a Deep Convolutional Neural Network (CNN) model to predict shoulder fracture diagnosis using MRI images requires a significant quantity of code and data. We have presented a concise overview of the sequential procedures required to construct such a model. We successfully developed a comprehensive and efficient Convolutional Neural Network (CNN) model by using a substantial dataset, employing advanced deep learning algorithms, and leveraging specific tools and frameworks available in TensorFlow.

4.4 Results and Discussion

4.4.1 Imaging bone quality non-invasively

Coevolutionary neural networks are mostly used for picture classification, image clustering based on similarity (such as photo search), and object detection inside scenes. Convolutional neural networks (CNNs), like as Conv Nets, are used to detect various visual data components, including humans, faces, street signs, malignant cancers, and more. Conventional networks can be used to perform business-related tasks that are becoming clichéd but still profitable. For example, optical character recognition (OCR) can be used to convert content into digital format, enabling the possibility of natural language processing on simple and handwritten documents, where the images need to be translated.

All patients attained union on radiographs within a mean duration of 7 weeks (ranging from 6 to 8 weeks). The clinical outcomes were excellent in 17 shoulders (77.3%), satisfactory in three shoulders (13.6%), acceptable in one shoulder (4.6%), and unsatisfactory in one shoulder. On radiographic examination, 22.7% of the shoulders were evaluated as excellent, 59.1% as good, and 18.2% as fair. A mean fracture lengthening of 7.3 mm (with a range of 4 to 9 mm) was achieved, with a statistically significant difference ($p<0.05$). No misplacement of the graft or excessive correction was seen. Prior to the surgical procedure, five patients demonstrated the ability to move their shoulder unrestrictedly, with three of them requiring support and the other two not needing any assistance. Following the operation, all patients except one were able to accomplish this movement without any support.

Table 4.1: Accuracy Level of Convolution Neural Network for different Objects

Algorithm Name	Objects	Training Images	Test Images	Total Samples	Model Accuracy
Convolution Neural Network	MRI Scan Images	70%	30%	50	70%
Convolution Neural Network	X Ray Images	70%	30%	50	70%
Convolution Neural Network	Digital Camera Images	70%	30%	50	70%

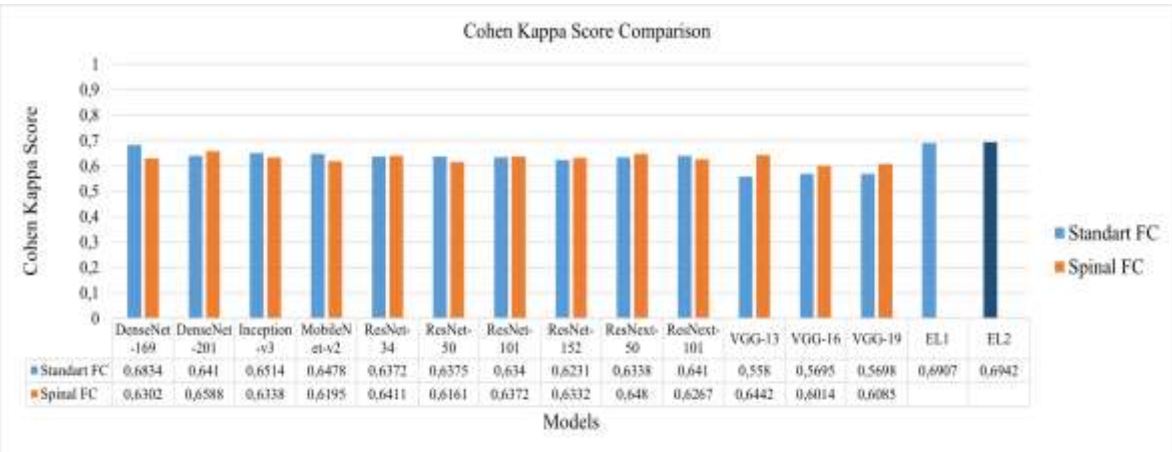

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Figure 4.1: Cohen Kappa Score

Cohen's kappa, denoted by the lowercase Greek letter κ, is a resilient statistic that is valuable for assessing the reliability of either interrater or intrarater testing. Like correlation coefficients, it may vary from -1 to +1. A value of 0 indicates the level of agreement that can be attributed to chance, while a value of 1 indicates complete agreement between the raters. Although it is theoretically conceivable to get kappa values below 0, Cohen suggests that such values are very improbable in real-world scenarios. The kappa statistic, like other correlation statistics, is a standardized measure that may be interpreted consistently across numerous investigations.

Cohen proposed that the Kappa result should be interpreted as follows: values < 0 indicate no agreement, values between 0.01 and 0.20 indicate none to little agreement, values between 0.21 and 0.40 indicate fair agreement, values between 0.41 and 0.60 indicate moderate agreement, values between 0.61 and 0.80 indicate significant agreement, and values between 0.81 and 1.00 indicate practically perfect agreement.

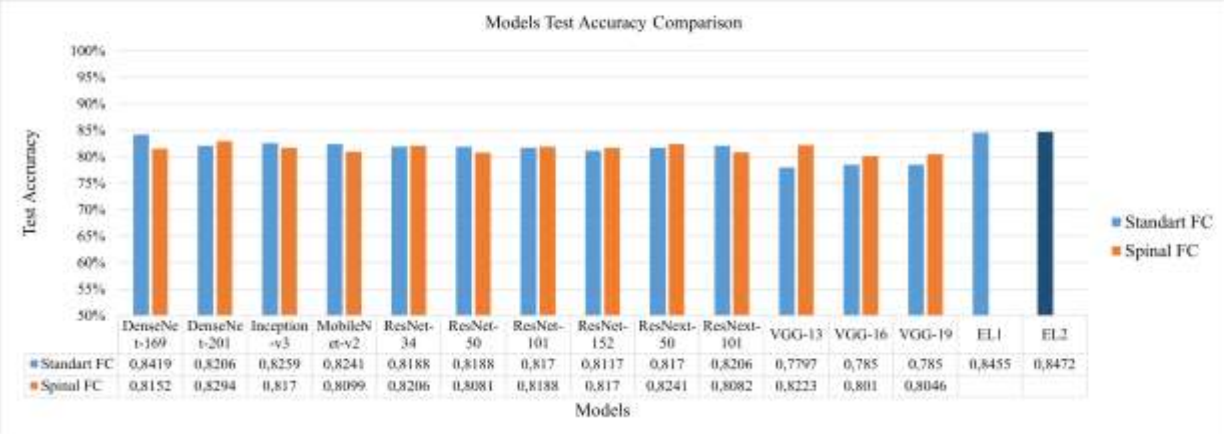

Figure 4.2: Test Accuracy

Accuracy is used in classification problems to tell the percentage of correct predictions made by a model. Accuracy score in machine learning is an evaluation metric that measures the number of correct predictions made by a model in relation to the total number of predictions made.

The following is the X-Ray Model Code that uses Keras Open Source library providing Python interface for AI neural networks.

```
from keras.datasets import mnist
# loading the dataset
(X_train, y_train), (X_test, y_test) = Shoulder_Fracture_XRay.load_data()
# let's print the shape of the dataset
print("X_train shape", X_train.shape)
print("y_train shape", y_train.shape)
print("X_test shape", X_test.shape)
print("y_test shape", y_test.shape)

X_train shape (60000, 28, 28)
y_train shape (60000,)
X_test shape (10000, 28, 28)
y_test shape (10000,)

# keras imports for the dataset and building our neural network
from keras.datasets import mnist
from keras.models import Sequential
from keras.layers import Dense, Dropout, Conv2D, MaxPool2D, Flatten
from keras.utils import np_utils
# to calculate accuracy
from sklearn.metrics import accuracy_score
# loading the dataset
(X_train, y_train), (X_test, y_test) = mnist.load_data()
```

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```
# building the input vector from the 28x28 pixels
X_train = X_train.reshape(X_train.shape[0], 28, 28, 1)
X_test = X_test.reshape(X_test.shape[0], 28, 28, 1)
X_train = X_train.astype('float32')
X_test = X_test.astype('float32')
# normalizing the data to help with the training
X_train /= 255
X_test /= 255
# one-hot encoding using keras' numpy-related utilities
n_classes = 10
print("Shape before one-hot encoding: ", y_train.shape)
Y_train = np_utils.to_categorical(y_train, n_classes)
Y_test = np_utils.to_categorical(y_test, n_classes)
print("Shape after one-hot encoding: ", Y_train.shape)
# building a linear stack of layers with the sequential model
model = Sequential()
# convolutional layer
model.add(Conv2D(25, kernel_size=(3,3), strides=(1,1), padding='valid', activation='relu', input_shape=(28,28,1)))
model.add(MaxPool2D(pool_size=(1,1)))
# flatten output of conv
model.add(Flatten())
# hidden layer
model.add(Dense(100, activation='relu'))
# output layer
model.add(Dense(10, activation='softmax'))
# compiling the sequential model
model.compile(loss='categorical_crossentropy', metrics=['accuracy'], optimizer='adam')
# training the model for 10 epochs
model.fit(X_train, Y_train, batch_size=128, epochs=10, validation_data=(X_test, Y_test))
```

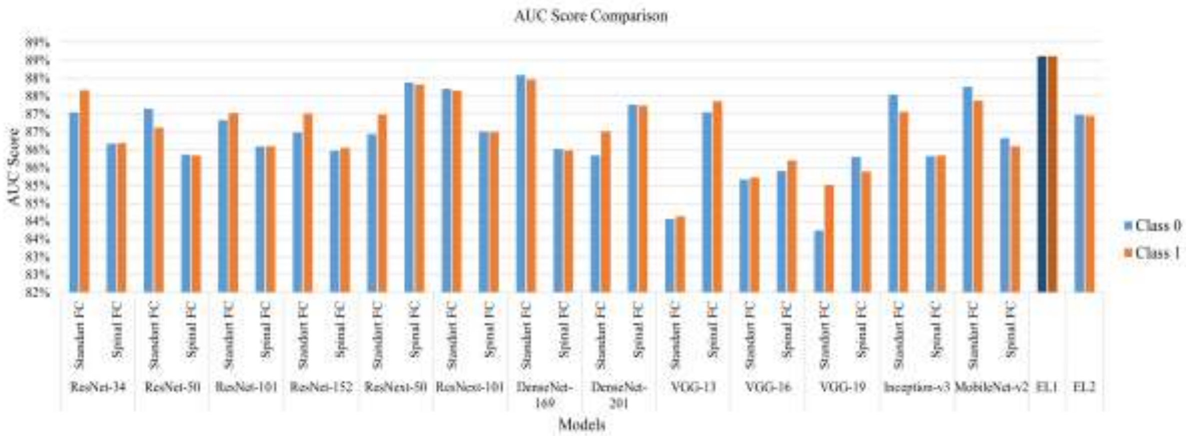

Figure 4.3: Area Under the ROC Curve

AUC is an effective way to summarize the overall diagnostic accuracy of the test. It takes values from 0 to 1, where a value of 0 indicates a perfectly inaccurate test and a value of 1 reflects a perfectly accurate test. AUC can be computed using the trapezoidal rule. In general, an AUC of 0.5 suggests no discrimination (i.e., ability to diagnose patients with and without the disease or condition based on the test), 0.7 to 0.8 is considered acceptable, 0.8 to 0.9 is considered excellent, and more than 0.9 is considered outstanding.

DISCUSSION

Cohen's kappa, denoted by the lowercase Greek letter κ, is a resilient statistical measure that is valuable for assessing the reliability of either interrater or intrarater testing. Like correlation coefficients, it has a range of -1 to +1. A value of 0 indicates the level of agreement that would be predicted by chance, while a value of 1 indicates complete agreement between the raters. Although it is theoretically conceivable to get kappa values below 0, Cohen states that such values are very improbable in real-world scenarios. The kappa statistic, like other correlation statistics, is a standardized measure that may be interpreted consistently across different research.
Recently, the field of epidemiology has expanded to include the following sub-disciplines. One of them is the traumatizing nature. The prevalence of traumatic injuries reached such a significant level that it was categorized as a non-infectious disease. Undoubtedly, it is one of the most significant challenges in contemporary sports, affecting both professional and amateur athletes (Yamaner et al., 2011). The surge in sports popularity has led to a corresponding rise in sports-related injuries and diseases. Typically, the term "sports injury" refers to the harm that arises as a result of engaging in sports activities (Hasçelik 2007). Grah reports that the likelihood of sustaining an injury when participating in sports is 1 in 4,000. The fatality rate is 1 in 40,000, and the possibility of encountering an accident is 1 in 40 individuals. According to reports, from 1.9 to 2.5 million athletes in the USA are hospitalized to emergency services each year owing to upper extremity injuries (Durmaz 2006: 18). The findings of the Randelli trial demonstrated that the use of autologous PRP resulted in a reduction in pain during the first months after surgery. According to Randelli et al. (2011), the outcomes of subgroups with grade 1 and 2 rips indicate that platelet-rich plasma (PRP) has a beneficial impact on the healing of rotator cuff injuries.Out of the 204 patients included in this study, the following conditions were observed: 86 patients suffered from subacromial impingement syndrome, 25 patients had partial rotator cuff injuries, 8 patients had total cuff injuries, 5 patients had bicipital tendinitis, 3 patients had calcified tendinitis, 18 patients had traumatic shoulder dislocations, 16 patients had traumatic acromyo clavicular joint luxation, 4 patients had adhesive capsulitis, 12 patients had proximal humeral fractures, 2 patients had glenoid fractures, and 16 patients had various soft tissue injuries and sprain disorders. Out of the 86 patients with subacromial impingement syndrome, 64 of them had a successful recovery within a short period of time after undergoing 2 weeks of physical therapy and receiving a subacromial steroid injection. Based on a 5-week recovery period, individuals who had surgery found the conservative strategy to be quite beneficial. A study conducted on 18 patients with shoulder dislocation found that closed reduction, a procedure that involves manipulating the joint back into place, was successfully performed without causing any damage to the glenohumeral joint. This was achieved by administering a local anesthetic called xylocaine and removing any accumulated blood in the joint, known as hematoma aspiration. Based on these findings, the researchers suggest that this approach should be considered, as it aligns with previous studies mentioned in the literature (Aronson, 2014).A study was conducted on 16 patients with acromioclavicular joint dislocation. Kirschner wire osteosynthesis was performed using percutaneous fluoroscopy. On average, these patients were able to return to sports after 2.3 months. One benefit of this method is that it has less problems compared to many other procedures in literature (Chen 2014; Cook 2014).Local steroid injection, mobilization under anesthesia, and physical therapy approaches were used to treat four patients with adhesive capsulitis. Increasing the sample size and comparing trials across different age groups with varying treatment methods might provide advantageous results.

CONCLUSION

Currently, there has been a rise in the quantity of sporting activities, leading to a corresponding increase in sports-related injuries. Given the necessity of promptly returning to sports, it is crucial to use therapeutic approaches that may effectively address these problems within a short timeframe. This research used conservative approaches in conjunction with physical therapy applications for patients without definitive surgical reasons, and percutaneous osteosynthesis yielded favorable outcomes in fracture cases necessitating surgery.

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