**Machine Learning Evaluation of Scapular Stabilization Exercises on Non-Specific Shoulder Pain in College Students**

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1. **Introduction**  
   Non-specific shoulder pain is a prevalent musculoskeletal condition among college students, often associated with poor scapular stabilization. Scapular stabilization exercises have shown promise in alleviating shoulder pain and improving functional outcomes. However, predicting the effectiveness of these exercises on individual patients remains a challenge. This proposal aims to utilize machine learning techniques to develop a prediction model that can accurately assess the effectiveness of scapular stabilization exercises in reducing non-specific shoulder pain in college students.
2. **Objectives**  
   The main objectives of this study are as follows:
   1. To collect data on non-specific shoulder pain and physical characteristics of college students.
   2. To design and implement scapular stabilization exercises as a treatment intervention.
   3. To develop a machine learning prediction model that can accurately evaluate the effectiveness of scapular stabilization exercises in reducing non-specific shoulder pain.
   4. To validate the prediction model using appropriate evaluation metrics.
   5. To assess the clinical implications and potential impact of the prediction model in guiding treatment decisions for non-specific shoulder pain.
3. **Methodology**  
   a) Data Collection: A cohort of college students with non-specific shoulder pain will be recruited for the study. Data will be collected on demographic information, physical characteristics, pain intensity, functional limitations, and baseline scapular stabilization status.

b) Scapular Stabilization Exercises: A standardized set of scapular stabilization exercises will be designed and implemented as a treatment intervention. The exercises will be tailored to each participant's specific needs and progression will be based on individual response and tolerance.

c) Data Analysis and Machine Learning Model Development: The collected data will be processed and prepared for machine learning analysis. Relevant features such as demographic factors, physical characteristics, and baseline scapular stabilization status will be selected. Various machine learning algorithms, such as support vector machines, random forests, and neural networks, will be employed to develop a prediction model.

d) Model Validation: The developed prediction model will be validated using appropriate evaluation metrics such as accuracy, precision, recall, and F1-score. Cross-validation techniques will be employed to ensure the model's robustness and generalizability.

1. **Expected Outcomes and Significance**

a) The developed machine learning prediction model will be able to accurately evaluate the effectiveness of scapular stabilization exercises in reducing non-specific shoulder pain in college students.

b) The model will provide clinicians with a tool to predict the individual response to scapular stabilization exercises, enabling personalized treatment planning and improving outcomes.

c) The study will contribute to the existing body of knowledge on non-specific shoulder pain and the effectiveness of scapular stabilization exercises.  
d) The findings of this study may have implications for the development of more targeted and effective rehabilitation programs for non-specific shoulder pain.

1. **Ethical Considerations**

The study will adhere to all ethical guidelines and obtain informed consent from participants. Confidentiality and privacy of participant data will be ensured throughout the study.

1. **Conclusion**  
   This proposal outlines a study that aims to develop a machine learning prediction model to evaluate the effectiveness of scapular stabilization exercises in reducing non-specific shoulder pain in college students. By providing a personalized and accurate assessment of treatment outcomes, the prediction model has the potential to optimize treatment decisions and improve patient outcomes. The findings of this study may contribute to the development of evidence-based rehabilitation programs for non-specific shoulder pain and pave the way for future research in utilizing machine learning for musculoskeletal disorders.