Predicting The Clinical Decision Limits of Locomotive Syndrome from The Screening Questionnaire Using Machine Learning.

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INTRODUCTION: The advancements in machine learning technology have expanded its applications across various fields, with the medical domain being no exception. In this study, we apply machine learning to predict locomotive syndrome (LS) without resorting to traditional methods. By constructing a model based on questionnaire data, we aim to elucidate the extent to which machine learning contributes to the early assessment of LS. This novel approach is anticipated to enhance diagnostic efficiency and expand opportunities for early intervention.

METHODS: We utilized data from 3,027 individuals aged 20 to 92, obtained from LS screenings conducted between 2017 and 2020. During the LS screening, we gathered information on patients' life histories, pre-existing conditions including lifestyle diseases, presence of musculoskeletal symptoms, occupation, marital status, and living conditions through questionnaires. Clinical decision limits (CDL) of LS were measured using the stand-up test, two-step test, and 25-Question Geriatric Locomotive Function Scale. Using a graphical user interface, we created neural networks ranging from single to multiple layers and prepared training and test data in CSV format. The data was trained and evaluated using the Neural Network Console by SONY. We performed classification for multi-class CDL (0,1,2,3) and binary classification for applicable/non-applicable LS.

RESULTS SECTION: In the test data, there were 173 individuals with CDL 1, 47 with CDL 2, 14 with CDL 3, and 269 with no applicable LS. Training was conducted by adjusting parameters such as age, gender, life history, medical history, and medication intake. The accuracy for multi-class classification in the test data was 74.2%, while the binary classification was 88.8%. Among the multi-class classifications, the highest accuracy was for CDL 2 at 95.8%, and the lowest was for CDL 3 at 75.0%.tistics.

DISCUSSION: Neither the multi-class nor the binary classification achieved an accuracy rate exceeding 90%. However, by addressing challenges such as accumulating more screening data, adjusting the neural network structure, and the number of parameters, there is potential to increase the accuracy rate and utilize it for screening purposes.

SIGNIFICANCE/CLINICAL RELEVANCE: The application of machine learning in predicting locomotive syndrome offers a transformative approach in orthopedic diagnostics, potentially streamlining early detection and facilitating timely, patient-centric interventions.