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Artificial Intelligence in Physiotherapy: A Narrative Review of Its Role in Assessment and Outcome Prediction

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Abstract: AI technologies are gaining traction in healthcare and have begun reshaping the landscape of physical therapy. This narrative review examines how AI is being used in the evaluation of patients and the estimation of rehabilitation outcomes. Recent developments in areas like movement tracking, predictive modeling, and digital decision aids are emphasized for their transformative impact on conventional rehabilitation methods. This paper also addresses the ethical, technical, and clinical complexities involved in adopting AI tools in physical therapy. Overall, the review concludes that while AI holds significant promise for advancing the field, careful clinical testing and ethical considerations remain critical for its safe and meaningful implementation.

INTRODUCTION

PHYSICAL THERAPY SERVES AS A VITAL COMPONENT OF REHABILITATION, OFFERING DIVERSE EVALUATION AND TREATMENT STRATEGIES TO ENHANCE MOVEMENT, FUNCTIONALITY, AND OVERALL WELL-BEING. AS CHRONIC DISEASES AND MUSCULOSKELETAL ISSUES CONTINUE TO RISE GLOBALLY, THERE IS AN INCREASING DEMAND FOR PHYSIOTHERAPY SERVICES TO BECOME MORE ACCURATE AND TIME-EFFICIENT. ARTIFICIAL INTELLIGENCE (AI), WHICH REFERS TO MACHINES THAT MIMIC HUMAN COGNITIVE FUNCTIONS, HAS EMERGED AS A VALUABLE RESOURCE IN THE HEALTHCARE SECTOR [1,3]. ITS CAPACITY TO ANALYZE VAST DATASETS, IDENTIFY COMPLEX PATTERNS, AND ASSIST IN CLINICAL DECISION-MAKING HAS LED TO ITS EXPLORATION IN PHYSICAL REHABILITATION [2,6]. WITHIN THIS CONTEXT, AI PROVIDES INNOVATIVE TOOLS TO STREAMLINE ASSESSMENTS, ANTICIPATE RECOVERY TRAJECTORIES, AND TAILOR TREATMENT STRATEGIES BASED ON REAL-TIME DATA [7,8]. THIS REVIEW EXPLORES HOW AI IS BEING INTEGRATED INTO PHYSICAL THERAPY PRACTICES, PARTICULARLY FOR ASSESSMENT AND PROGNOSIS, WHILE ALSO CONSIDERING THE BENEFITS AND POTENTIAL BARRIERS TO ITS ADOPTION.

METHODOLOGY

A narrative review approach was employed to gather and synthesize published literature on the application of Artificial Intelligence in physical therapy, with a focus on patient evaluation and outcome forecasting. Data were retrieved through a detailed search of electronic databases such as PubMed, Scopus, IEEE Xplore, and Google Scholar. Search terms included “Artificial Intelligence,” “Physical Therapy,” “Rehabilitation,” “Prognostic Modeling,” and “Clinical Assessment.” The review considered peer-reviewed articles published in English between 2015 and 2024. Eligible sources included original research papers, review articles, and clinical investigations that discussed AI in the context of physical therapy. Studies not published in English, lacking direct relevance to physiotherapy, or with weak methodological design were excluded. The selected

literature was analyzed and categorized by themes to reveal emerging trends, practical uses, and barriers to AI integration in rehabilitation settings.

APPLICATIONS OF AI IN PHYSIOTHERAPY

Artificial Intelligence offers a broad spectrum of uses in the field of physical therapy. In clinical assessment, systems powered by AI—such as motion tracking tools and visual recognition software—allow for precise analysis of body mechanics, posture, and gait [5,6]. Wearable devices combined with machine learning techniques enable real-time monitoring of rehabilitation progress and help identify irregular movement patterns [4]. When it comes to prognosis, AI utilizes historical datasets and predictive algorithms to estimate treatment outcomes, recovery durations, and potential risks [7,8]. Additionally, AI-enhanced clinical decision tools integrated into digital health records assist therapists in making evidence-based treatment choices, ultimately boosting both therapeutic effectiveness and workflow efficiency [9].

Table No 1 Showing summery of AI application, tools and Clinical Relevance

Domain	AI Application	Tools/Technology	Clinical Relevance
Movement & Gait Analysis	Real-time tracking of joint kinematics	OpenPose, Kinect, IMU sensors	Stroke, Parkinson's rehab
Spinal & Posture	Spine alignment detection	Computer Vision, AI apps	Scoliosis, postural training
ROM Measurement	Dynamic joint motion analysis	Kinovea, AI-driven tools	Orthopedic rehabilitation
Muscle Activity	EMG pattern classification	AI-analyzed EMG	Neuro rehab, fatigue monitoring
Outcome Prediction	Forecasting recovery/relapse	ML models (RF, XGBoost)	Chronic pain, stroke outcomes
Wearable Therapy	Sensor-assisted remote therapy	DorsaVi, Kaia Health	Home-based telerehab
Fall Risk & Pain Forecast	Predicting chronicity/fall risk	AI dashboards + sensors	Geriatric rehabilitation

ETHICAL AND PRACTICAL CONSIDERATIONS

INCORPORATING AI INTO PHYSICAL THERAPY PRACTICES INTRODUCES SEVERAL ETHICAL CHALLENGES THAT REQUIRE CAREFUL CONSIDERATION. CHIEF AMONG THESE IS THE PROTECTION OF PATIENT PRIVACY, AS AI SYSTEMS OFTEN DEPEND ON EXTENSIVE, SENSITIVE HEALTH DATA FOR EFFECTIVE FUNCTIONING [1]. ENSURING ETHICAL DATA HANDLING AND SECURE STORAGE IS IMPERATIVE. ADDITIONALLY, THE RISK OF ALGORITHMIC BIAS POSES A CONCERN—AI MODELS THAT ARE TRAINED ON INCOMPLETE OR SKEWED DATASETS COULD RESULT IN DISPARITIES IN CARE QUALITY [8,9]. THE NEED FOR TRANSPARENCY IN HOW AI ARRIVES AT CLINICAL RECOMMENDATIONS IS ALSO VITAL FOR MAINTAINING TRUST BETWEEN CLINICIANS AND PATIENTS [10]. LASTLY, IT IS IMPORTANT THAT TECHNOLOGICAL ADVANCEMENTS DO NOT ERODE THE PERSONAL AND COMPASSIONATE ASPECTS OF THERAPEUTIC CARE. PHYSICAL THERAPISTS MUST STRIVE TO INTEGRATE AI TOOLS IN A MANNER THAT COMPLEMENTS, RATHER THAN REPLACES, HUMAN-CENTERED CARE.

CONCLUSION

ARTIFICIAL INTELLIGENCE HOLDS TRANSFORMATIVE POTENTIAL FOR THE FIELD OF PHYSICAL THERAPY BY IMPROVING DIAGNOSTIC PRECISION, ENABLING INDIVIDUALIZED TREATMENT STRATEGIES, AND REFINING THE PREDICTION OF PATIENT OUTCOMES. WHEN PROPERLY INTEGRATED, AI CAN AID CLINICIANS IN MAKING INFORMED, DATA-SUPPORTED DECISIONS WHILE MINIMIZING VARIABILITY IN ASSESSMENTS AND ENHANCING REHABILITATION WORKFLOWS. NONETHELESS, FOR AI TO BE EFFECTIVELY IMPLEMENTED, IT IS ESSENTIAL TO NAVIGATE AND RESOLVE VARIOUS TECHNOLOGICAL, ETHICAL, AND CLINICAL BARRIERS. ONGOING AND FUTURE RESEARCH SHOULD EMPHASIZE THE CLINICAL VALIDATION OF AI APPLICATIONS AND THE ESTABLISHMENT OF ETHICAL AND OPERATIONAL FRAMEWORKS THAT PROMOTE RESPONSIBLE, INCLUSIVE, AND BENEFICIAL USE OF THESE TECHNOLOGIES IN THERAPEUTIC SETTINGS

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CONFLICT OF INTEREST

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