

INPLASY PROTOCOL

To cite: Zhang et al.
Application of 3D gait
assessment in scoliosis
correction and rehabilitation.
Inplasy protocol 202310056.
doi:
10.37766/inplasy2023.1.0056

Received: 18 January 2023

Published: 18 January 2023

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Support: At my own cost.

**Review Stage at time of this
submission:** Preliminary
searches.

Conflicts of interest:
None declared.

Application of 3D gait assessment in scoliosis correction and rehabilitation

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Review question / Objective: The purpose of this review article was to summarize the application of 3D gait assessment in scoliosis correction and rehabilitation providing temporal spatial, kinematics, kinetics, surface electromyography, and energy consumption parameters.

Condition being studied: Scoliosis is a three-dimensional spinal deformity that causes pain, limited mobility, and altered gait patterns, causing serious family and social burdens.

Information sources: The following databases were searched: Pubmed, Embase, Science Direct and ISI web of knowledge using the words "OR," "AND," and "NOT." Keywords related to the population included scoliosis, scoliotic, and idiopathic scoliosis; keywords related to the intervention included surgery/fusion/orthosis/brace/spinal brace(s)/spinal orthosis(es)/thoracolumbosacral orthosis/TLSO/Milwaukee brace/ Boston brace/Cheneaubrace/spineCor/Wilmington/Lyonnais/rehabilitation/exercise/training/treatment, and keywords related to the outcome measures included gait, walking, walking speed, walking velocity, kinetics, kinematics, cadence, step length, stride length, step width, stride width, spatiotemporal, temporospatial, energy expenditure, energy cost, electromyography, and EMG.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 18 January 2023 and was last updated on 06 March 2023 (registration number INPLASY202310056).

INTRODUCTION

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providing temporal spatial, kinematics, kinetics, surface electromyography, and energy consumption parameters.

Condition being studied: Scoliosis is a three-dimensional spinal deformity that

causes pain, limited mobility, and altered gait patterns, causing serious family and social burdens.

METHODS

Participant or population: (1) participants with scoliosis; (2) spinal orthosis, spinal surgery and other rehabilitation intervention were used as one of the treatment; (3) At least one of the temporal spatial parameters, kinematics, and kinetics, muscle activation and energy expenditure were included in the study.

Intervention: Spinal orthosis, spinal surgery or other spinal treatment.

Comparator: No comparator.

Study designs to be included: Trials, prospective study, case control study.

Eligibility criteria: The search strategy was based on the various intervention for scoliosis using gait analysis as relevant outcome measurement and included all relevant articles published between 2000 and 2023.

Information sources: The following databases were searched: Pubmed, Embase, Science Direct and ISI web of knowledge using the words "OR," "AND," and "NOT." Keywords related to the population included scoliosis, scoliotic, and idiopathic scoliosis; keywords related to the intervention included surgery/fusion/orthosis/brace/spinal brace(s)/spinal orthosis(es)/thoracolumbosacral orthosis/TLSO/Milwaukee brace/ Boston brace/ Cheneaubrace/spineCor/Wilmington/Lyonnaise/rehabilitation/exercise/training/treatment, and keywords related to the outcome measures included gait, walking, walking speed, walking velocity, kinetics, kinematics, cadence, step length, stride length, step width, stride width, spatiotemporal, temporaspatial, energy expenditure, energy cost, electromyography, and EMG.

Main outcome(s): The main outcomes include results from 3D gait analysis, EMG and energy consumption results. 3D gait analysis results will provide information about gait changes after various intervention, including temporal spatial parameters (walking velocity, cadence, step length, stride length, step width, stride width), kinematics (mainly focus on pelvis and lower limbs) and kinetics (joint moments, joint power and ground reaction force). EMG will provide information about muscle activation pattern, timing and effect. Energy consumption provide information about changes in energy cost with different treatment strategies.

Quality assessment / Risk of bias analysis: The article quality assessment tool mainly evaluates the research methods of the included articles and potential flaws that may jeopardize the internal validity. According to different types of included articles, select the appropriate article quality assessment tool. Among the included studies, three article types were involved: (1) case-control; (2) non-randomized controlled trials; (3) randomized controlled trials. The Newcastle-Ottawa Scale (the Newcastle-Ottawa Scale, NOS) was used to evaluate the quality level of case-control studies. It mainly evaluates three major sections: population selection (selection), comparability (comparability), exposure (exposure)/outcome (outcome) evaluation. Non-randomized intervention trials used the methodological index for non-randomized studies (MINORS) tool to assess the risk of bias of the included research. There are 12 evaluation indicators in total, and each item is divided into 0-2 points. The first 8 items are for studies without a control group, with a maximum score of 16 points; the last 4 items and the first 8 items are for studies with a control group, with a maximum score of 24 points. A score of 0 means not reported; 1 means reported but with insufficient information; 2 means reported with sufficient information. Randomized controlled studies used the Cochrane risk of bias assessment tool to discuss sources of bias based on seven dimensions,

namely, risk of bias assessment from selection bias, implementation bias, measurement bias, follow-up bias, reporting bias, and other biases.

Strategy of data synthesis: All the data will be pulled together and classified into 5 categories: temporal-spatial parameters, kinematics, kinetics, EMG data and energy consumption.

Subgroup analysis: There is no subgroup analysis.

Sensitivity analysis: This study is a literature review, there will be no sensitivity analysis in this study.

Country(ies) involved: Mainland China.

Keywords: scoliosis; 3D gait analysis; EMG; Energy consumption; Orthoses; surgery.

Contributions of each author:

Author 1 - Jing Zhang - Author 1 drafted the manuscript.

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