Developing an Indicator-based Sustainability Framework for the Transition to In Silico Modelling in Healthcare

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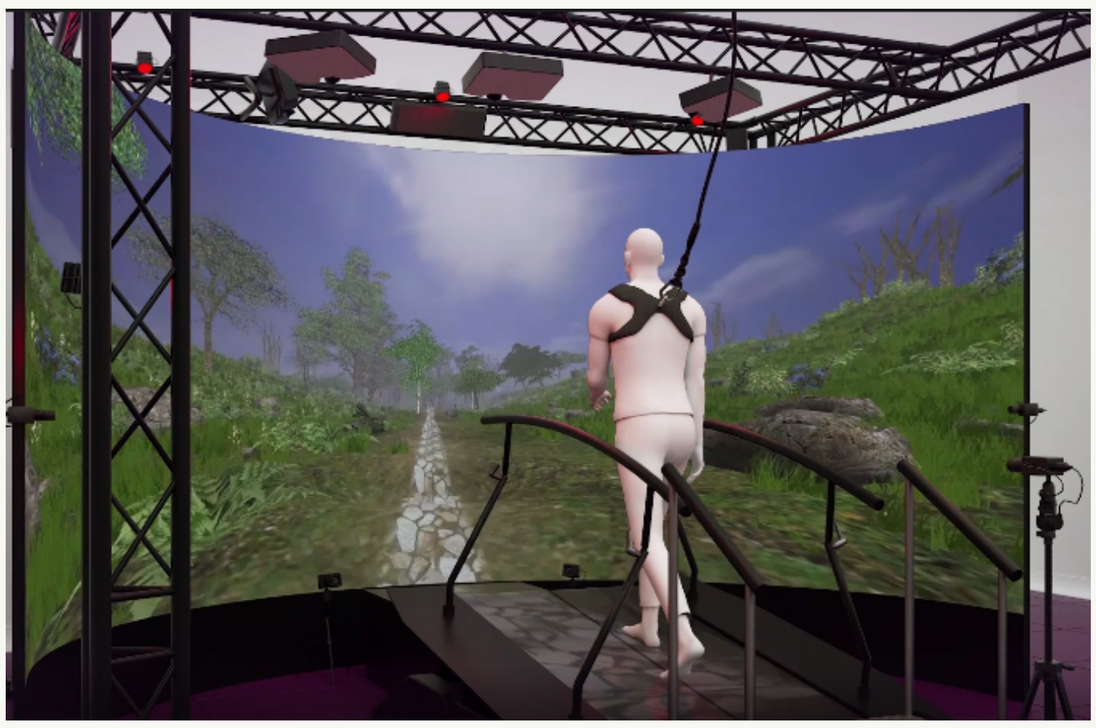
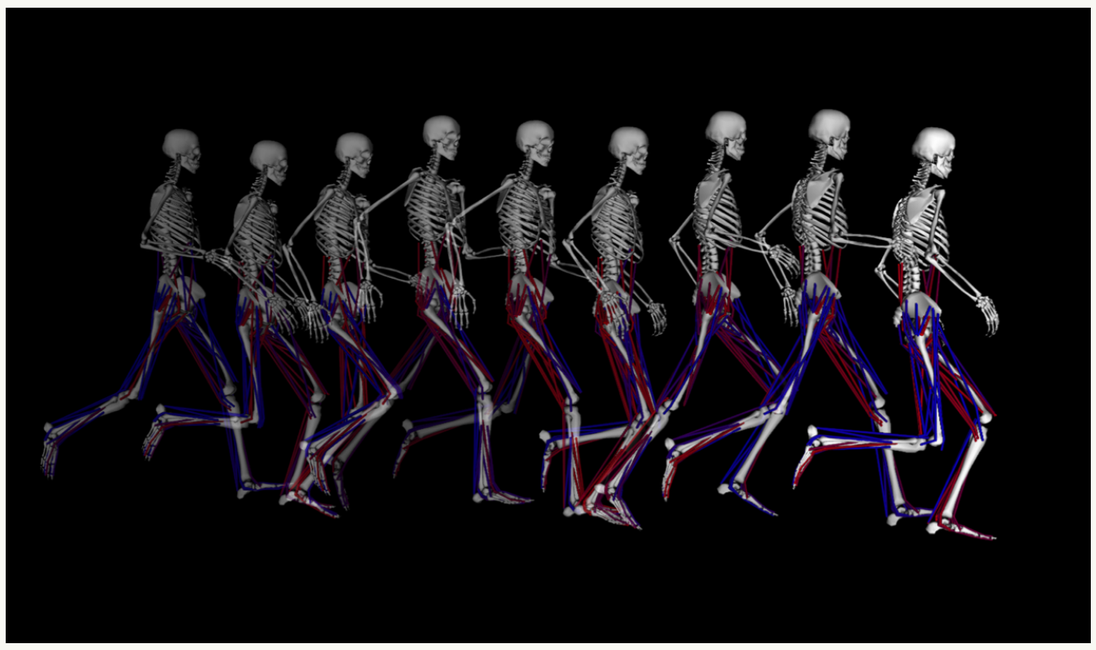


Set up of a motion lab



In silico model of a person walking

INTRODUCTION

In recent years, computational modelling is increasingly used in medicine. In the scope of osteoarthritis (OA), this could suffice as a highly effective tool to model and predict the force workings of the knee and how, for each patient specifically, this could be treated best. With the deleterious influences humanity has on the environment, it is important that the environmental aspect of this innovative technology is considered. Therefore a more broad assessment framework is developed to help make the transition from all sorts of clinical pathways to in silico more sustainable a priori.

OBJECTIVE

In the Erasmus Medical Centre (EMC), a new lab is being built to model osteoarthritis using *in silico* modelling. The environmental impacts of *in silico* modelling are thus far not known for this specific topic; hence, this research aims to answer the following question:

“What are the environmental impacts of in silico modelling of osteoarthritis and how does this compare to a clinical pathway?"

METHODOLOGY

For this research, the rough methodology of Arushayans et al’s (2017) Sustainability Assessment Framework for Scenarios (SAFS) will be followed.

This will result in an indicator-based sustainability assessment which includes environmental and social (including ethical considerations) aspects important to the transition.

This required an extensive technical literature review of the relevant indicators for the software and hardware used in this method, as well as the practices around the pathways.

In silico model can estimate the forces distributed in a knee. Giving insight into the specific mechanics of the joint.

RESULTS

This research has so far identified relevant environmental and social sustainability aspects of a transition to in silico modelling in the healthcare sphere. These are:

- **Environmental**: energy use, greenhouse gas (GHG emissions), water use, ozone layer depletion, air quality, land use, minerals use, chemical waste.
- **Social**: life satisfaction, life expectancy, perceived health status, health spending, health equity, suicide, autonomy, beneficence, non-maleficence.

There are also relevant contextual factors identified that could have an influence on the process of transitioning to an in-silico-based clinical pathway. These so far are:

- **Lifestyle,**
- **Health care organisations,**
- **(Green) IT maturity,**
- **Industry and Technology,**
- **Transport, &**
- **Societal norms.**

Contextual factors	Environmental aspects	Social aspects
Lifestyles	Yes	Yes
Health care organisations	Yes	No
(Green) IT maturity	Yes	Yes
Industry & technology	Yes	Yes
Transport	Yes	No
Societal norms	No	Yes

A simplified version of the interrelational analysis. Aims to create an overview of how the varying elements are intertwined and connected.

WHAT'S TO COME?

The assessment framework is almost finished. Once it is, the following steps will be undertaken:

1. Apply the framework to the case of the EMC osteoarthritis motion lab;
2. Identify possible improvements to the framework;
3. Discuss the results in relation to the goals of the study, data gaps, uncertainties, assumptions made, and future implications.

Once this is done, qualitative results can be presented on where the opportunities but also the risk lie in transitioning to in silico. With these results, further research can be done more specifically in these fields to possibly quantify the effects or determine strategies to achieve the suggested goals.

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