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SPINE MODELLING AND 'SAFE TO USE' EQUIPMENT DESIGN

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INTRODUCTION:
Computer human modelling has for sometime been developed and used but even the most sophisticated commercially available human modelling packages do not have an effective spine model. Although some packages have a geometric representation of the spine, they have no analytic or design application functionality. On the other hand back pain and back injuries are well-known to be a major problem and lead to substantial costs to manufacturing industry through enforced absenteeism. (NBPA, 1995). The main objective is to provide an answer to the need for a design tool which can consider the range of postures and predict the loads that will be imposed on the spine.

METHODS:
The creation of a geometric model of the spine has been our first step to the mathematical modelling work. The geometric model describes the geometry of the spinal components and parametric solid modelling techniques have been used to generate the family in order to accommodate anthropometric variability between individuals. (Stepney *et al, 1996).* Then the mathematical model has been developed to predict the spinal component loads for several postures. Optimisation techniques have been used to estimate 'good postures'.

RESULTS AND CONCLUSION:
The intra-discal pressures calculated from the force polygon of the optimised thrust lines in multiple arch model are compared with the published data from the experimental measurement in the literature. It is found that the calculated results compare well with the experimental data. The initial objective has been to generate a general purpose spine model that is suited to a wide range of different applications. However it is important that the nature of the human body gives rise to the need to be able to cope with a variety of specific conditions. Flexibility and sensibility of our modelling techniques have been evaluated by consideration of needs and limitations of pregnant women and their use of exercise machines. This has been a particularly good example of use of computer biomechanics modelling where the alternative to some form of model simulation is unacceptable use of laboratory experiments (on health and safety grounds).

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