resolved. Until this is achieved, clinical gait data captured by one of the above systems can only be compared with data captured by the same system to ensure patient care is maintained.

References

[1] Everett T, Trew M. Human Movement: An Introductory Text. 5th Edition. Churchill and Livingstone; 2006.

O048

Sensitivity of the OLGA and VCM models to erroneous marker placement in 3D-gait analysis

B. Groen[1], M. Geurts[2], B. Nienhuis[1], J. Duysens[2]. *[1]Research, Development and Education, Sint Maartenskliniek, The Netherlands; [2]Research Center for Movement Control and Neuroplasticity, KU Leuven, Belgium*

Summary: In this study the sensitivity to variations in marker placement was determined using two models for 3D-gait analysis [Optimized lower limb gait analysis (OLGA) versus Vicon clinical manager (VCM)]. In general, gait variables were sensitive to marker placement of 10 mm resulting in errors larger than the normal variability during gait. The sensitivity was especially high for the knee and thigh markers. OLGA was less sensitive and therefore more reliable than the VCM model.

Conclusions: Precise and consistent marker placement, particularly for the knee and thigh markers is very important. Based on the sensitivity to marker displacement, the OLGA model should be preferred to VCM for 3D-gait analysis.

Introduction: A primary requirement of 3D-gait analysis for use in clinical practice is reliability of the collected gait data. Incorrect marker placement is known as an important source of error. To reduce the impact of these errors in marker placement, an optimization technique known as the OLGA model was developed. Charlton et al [1] tested this model for inter-observer repeatability and concluded that the repeatability of OLGA was better than the VCM model. However, to determine the markers and directions of displacements that are most sensitive to errors, it is important to apply a standard displacement instead of relying on natural variation. The purpose of the present study was to use a standard marker displacement to assess the sensitivity to errors in marker placement of the OLGA model compared to the VCM model in a large group of subjects.

Patients/Materials and Methods: Twenty healthy adults underwent six sessions of gait analysis. For the first session, the modified Helen Hayes marker set [2] was used. For the following sessions, marker displacements of 10 mm of either the thigh, knee or shank markers in anterior/posterior direction or the knee and ASIS markers in vertical direction were applied. Kinematic and kinetic data were collected using a six-camera motion capturing system (Vicon, 100 Hz) in combination with a force plate (Kistler, 2400 Hz). To determine the sensitivity, the root mean square (RMS) values of the kinematic and kinetic gait variables were calculated with respect to the (first) session with normal marker configuration. The sensitivity was compared to the normal walking variability in this population.

Results: For all hip, knee and ankle angles and hip moments OLGA showed lower RMS values compared to VCM in joint angles and knee moments (all $p < 0.05$). The RMS in both models and the difference in RMS between the models were higher than the normal variability. For kinematic data, errors and differences in errors were most pronounced in the frontal and transverse plane. For instance, the RMS for the anterior knee marker displacement session was 9.8 degrees using VCM, 3.5 degrees using OLGA, while the normal variability was 0.8 degrees for varus/valgus rotation in knee. With OLGA there was less cross-talk in the frontal plane. In knee moments, the sensitivity was most obvious in the sagittal plane. Knee and thigh marker displacements in anterior/posterior direction caused the largest RMS values in kinematic and kinetic data.

Discussion: The VCM model and the OLGA model used in 3D gait analysis are both sensitive to marker displacement, but the sensitivity was significantly reduced when using the OLGA model. This is in line with the findings of Charlton et al [1] who found a better repeatability for OLGA. In addition, the present study showed that the reduction in sensitivity by OLGA was larger than the normal variability, indicating that the reduction was relevant. Furthermore, special attention should be given to the precise and consistent placement of the knee and thigh markers in anterior/posterior direction since the sensitivity was especially high for these marker displacements.

References

[1] Charlton et al. (2004). Repeatability of an optimised lower body model. Gait and Posture 20(2): 213–221.

[2] Davis et al. (1991). A gait analysis data collection and reduction technique. Human Movement Sciences 10: 575–587.

Oral Session 9: Normal & pathological gait

O049

Ageing and gait variability – a population-based study of older adults

M. Callisaya[1], L. Blizzard[1], M. Schmidt[1], J. McGinley[2], V. Srikanth[3]. *[1]Menzies Research Institute, Uni of Tasmania; [2]Gait CCRE, Murdoch Children's Research Institute; [3]Monash Medical Centre, Monash University, Australia*

Summary: Age was associated with greater step-to-step variability in temporal and spatial gait measures in this large cross-sectional population-based study. Results suggest that speed is an intermediate in the pathway between age and step time and double support phase time (DSP) whereas step width appears to be largely independent of gait speed.

Conclusions: These are the first results describing associations between age and a range of temporal and spatial gait variability measures in a large population-based sample. They show that gait variability is positively associated with age.

Introduction: Greater gait variability may be associated with risk of falling and with clinical diseases such as Parkinson's disease [1,2]. However, few studies have examined how variability changes with age in older populations. The study of how gait variability is affected by age may lead to a better understanding of the mechanisms underlying falls in older people and allow preventative interventions to be targeted at appropriate age groups. Accordingly, the aim of this cross sectional study was to examine associations between age and measures of gait variability in a population-based sample of older adults.

Patients/Materials and Methods: Men and women aged 60–86 years (n = 410) were randomly selected from the Southern