JOINT MOMENTS IN GAIT WITH SIDED LOAD CARRIAGE

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INTRODUCTION: The present study investigated the biomechanical effects of weight variation for sided load carriage during walking upon joint moments by using the tracker agent and joint driving dynamic analysis.

METHOD: One male (age: 23.2, height: 174cm, body mass: 65.5kg) was selected as subject for the study. Subject who had no musculoskeletal diseases and had no problems during normal walking motions was chosen for the experiment. Gait analysis was performed by using a 3D motion analysis system (Vicon Motion System Ltd., England) with six infrared cameras, coupled with two force plates (AMTI, U.S.A.). Thirty nine 14mm reflective markers, according to the plug-in-gait marker set, were attached to the subject. We used a commercial program, BRG.LifeMOD (Biomechanics Research Group, Inc., USA), for skeletal modeling and inverse and joint driving dynamic simulation during one gait cycle. The present study calculated knee, hip, thoracic and lumbar joint moments by joint, which is acquired in inverse dynamic simulation, driving dynamic simulation. In walking with a sided load carriage, the subject, virtual musculoskeletal model, held the carriage with the right hand, which weighed 0, 5, 10, 15kg, 20kg respectively in ADAMS (MSC.Software corporation, USA).

RESULTS: Table 1 shows the maximum value of joint moments for changes in weight.

Table 1 Maximum value of Joint moments (N·m)

	0kg	5kg	10kg	15kg	20kg
Knee(right)	5.54E+01	6.24E+01	6.64E+01	6.88E+01	7.08E+01
Hip(right)	6.29E+01	7.36E+01	7.80E+01	8.02E+01	8.16E+01
thoracic	-1.11E+01	-4.31E+01	-9.64E+01	-1.33E+02	-1.55E+02
lumbar	-7.71E+00	-3.39E+01	-8.94E+01	-1.17E+02	-1.33E+02

DISCUSSION: These results, simulation data, show that knee and hip were inclined to the loaded side and loaded side had a larger moment as the sided load carriage was increased. On the other hand thoracic and lumbar had a larger negative value as the sided load carriage was increased. These values mean that thoracic and lumbar were inclined to the unloaded side and had a larger moment because this musculoskeletal model maintained the gait.

CONCLUSION: This study identified the biomechanical effects of weight variation for a sided load carriage upon walking. Our results showed that knee and hip did not resist the moment generated by gravity of carriage. But thoracic and lumbar kept the balance of the body and gait motion. These results could be very useful in analysis for delivery motion of daily life.

REFERENCES:

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