# Immediate Effects of Manual Traction on Radiographically Determined Joint Space Width in the Hip Joint

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## Abstract

**Objective:** The purpose of this study was to investigate the immediate effects of manual traction of the hip joint on joint space width (JSW) on asymptomatic subjects.

**Methods:** Asymptomatic, healthy male volunteers (n = 15), aged 25 to 34 years were included in this study. Three radiographs were obtained with the subjects in the supine position, before and after loading with 10% of his body weight, and after manual traction on only the right hip joint. Joint space width was measured by a radiologist at the point described by Jacobson and Sonne-Holm.

**Results:** There were significant changes in JSW on the right hip joint and left hip joint between the baseline (before loading) and immediately after loading. We also observed a significantly increased JSW on only the right hip joint between periods that followed loading and manual traction on the right hip joint. There was no significant change in JSW on the left hip joint between periods that followed loading and manual traction on the right hip joint.

**Conclusions:** The results of this study suggest that a significant increase in JSW in young, healthy male patients can occur immediately after manual traction of the hip joint. (J Manipulative Physiol Ther 2014;xx:1-7)


**Key Indexing Terms:** *Hip; Traction; Radiography; Osteoarthritis*

Osteoarthritis (OA) is a common disorder of the synovial joints and has increased prevalence in people who are 60 years or older. It is characterized by the narrowing of joint spaces (progressive damage to the articular cartilage) and new bone formation (osteophytes). The hip joint is the most commonly affected by OA after the knee, and OA has become one of the most common causes of disability in elderly individuals.[1] Risk factors for hip OA include genetics, age, obesity, joint malalignment, and sex.[2,3] Symptoms of hip OA include pain in the groin, buttocks, lateral or anterior thigh, and knee, particularly during or after weight-bearing activities. A clinical indicator of hip OA is painful restriction of hip movements. Radiologic indicators include decreased joint space, osteophyte formation, and subchondral sclerosis.[1,4] Severe hip OA leading to complete joint destruction eventually requires surgical intervention.

Treatment of hip OA ranges from conservative management to surgery. Conservative management includes walking, aerobics or aquarobic exercise, and education.[5-9] Joint mobilization and manipulation are also commonly used and recommended for patients with hip OA.[10-14] In a treatment modality, traction force is applied manually along the long axis of the femur (manual traction) and is called long-axis mobilization or manipulation (also called long-axis distraction and traction). Previous studies reported that long-axis mobilization or manipulation of the hip joint results in favorable outcomes.[10-15] In long-axis mobilization or manipulation, the leg is pulled caudally to separate opposing joint surfaces; this may widen the joint space width (JSW) and may help unload the joint cartilage.

MacDonald et al[11] reported the benefits of long-axis mobilization, which included a decrease in pain, and improvement in range of motion (ROM) and disability in 7 patients. Strunk et al[13] also reported that patients who received treatments including long-axis mobilization showed improvements in the impression of their change and gait. Furthermore, a randomized controlled trial found that patients treated with long-axis mobilization had better outcomes with regard to pain, function, and ROM compared with patients treated with only an exercise therapy program.[10]

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Results from a recent study by Abbot et al[9] were consistent with those of Hoeksma et al.[10]

Several studies have investigated the effects of traction force on JSW.[16-19] One study examined JSW in the glenohumeral joint after manual traction but reported no change in JSW.[18] Studies involving the ankle and knee joints indicated an increase in JSW after treatment similar to manual traction.[16,17,19] However, in these studies, an external fixator was used to apply traction force. Thus, no studies have evaluated the mechanical effect of manual traction of the hip joint on JSW, although this technique is frequently used. Therefore, the purpose of this study was to investigate the immediate effects of manual traction of the hip joint on JSW in asymptomatic subjects.

## Methods

### Subjects

This study included 15 asymptomatic, healthy male volunteers (25-34 years). Subjects were excluded if they had a history of hip disorders or surgery. All subjects were informed of the study design and objectives and provided written informed consent before participating in the study. This study was conducted with ethical approval from the Committee for Clinical Research of Osaka Kaisei Hospital.

***Experimental Procedure.*** At the beginning of the study, subjects were asked to lie in a supine position for 10 minutes, with the aim of eliminating any abnormal loading on the hip joints that may have preceded the subject's arrival at the laboratory. After the resting period, the first anterior-posterior radiographs (baseline) (DR-1000; Hitachi, Tokyo, Japan) were obtained using a previously described method and well-established method for measuring JSW.[20-22] For all radiographs, subjects were asked to lie in the supine position with their feet straight and pointed upward, while their lower extremities were placed in a neutral abduction-adduction position along the limb's functional axis. The x-ray beam was centered 2 cm over the pubic symphysis along the vertical midline. The tube-to-film distance was 120 cm in all cases.

After the first radiographs were obtained, subjects walked to an examination room that was approximately 3 m from the x-ray room. Then, subjects remained in a standing position and were loaded with 10% of their body weight placed directly over their waist for 10 minutes (Fig 1). This loading method, a modification of a method reported in previous studies,[23,24] was used to load the hip joints and subsequently reduce the joint space. Subjects were instructed to equally distribute their weight on both feet for bilateral loading on their hip joints. Subjects received feedback during this period via the MatScan system (Nitta Co, Osaka, Japan; Fig 1). After loading, subjects walked back to the x-ray room and returned to the supine position in which the first radiograph was taken, and we obtained a second set of radiographs.

**Fig 1.** *Weight bearing before first radiograph is shown. Subjects were standing 10 minutes with 10% of their weight over their weight. MatScan system was used for distributing their weight equally on the feet. (Color version of figure is available online.)*

After the radiographs and while the subjects were in the same supine position, manual traction on the right hip joint was performed by an examiner who has more than 15 years of experience with this technique. To investigate the immediate effect of manual traction, we decided to apply traction force to subjects while they remained on the radiographic table. We also expected that the radiograph obtained without changing posture after application of manual traction could show the effects of the traction force and would mitigate confounding factors arising from positional change. Throughout the manual traction procedure, an assistant stabilized the subject's pelvis. The therapist performed traction by placing his hands just above the ankle and mobilizing the hip joint by flexing and abducting it to 30° and slight external rotation (maximum loose-packed position). The assistant used goniometer for having subjects taken maximum loose-packed position. The hip joint then was pulled caudally for traction force until the therapist felt maximum resistance (Fig 2). The traction force was applied 3 times for 10 seconds with a 5-second rest interval between each traction. The traction force applied was not controlled among subjects because the force required depended on the subject's clinical presentation. A third set of