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Interesting Articles for KEMA Members

IJSPT

ORIGINAL RESEARCH

GLUTEAL MUSCLE ACTIVITY DURING WEIGHTBEARING AND NON-WEIGHTBEARING EXERCISE

Matthew J. MacAskill, BS[1]
Thomas J.S. Durant, MPT[2]
David A. Wallace, PT, PhD[3]

ABSTRACT

Background: Researchers suggest that decreased strength of the gluteus medius (GMed) and the gluteus maximus (GMax) muscles contributes to the etiology of various orthopedic pathologies of the knee. Currently, equivocal evidence exists regarding Electromyography (EMG) activity of gluteal musculature during weight-bearing (WB) and non-weightbearing (NWB) exercise. The purpose of this study was to compare GMed and GMax muscle activation during WB functional exercise and NWB 10 repetition maximum (RM) exercises.

Methods: Surface EMG electrodes recorded the muscle activity of the GMax and GMed as subjects performed three sets of 10 repetitions of the following exercises: (1) forward step-up, (2) lateral step-up, (3) 10 repetition maximum (10 RM) side-lying hip abduction and (4) 10 RM prone hip extension. The 10 RM resistances were determined one week prior to data collection.

Results: The GMed was recruited significantly more during side-lying 10 RM than the remaining exercises (side-lying: 89.9 ± 17%, vs. lateral step-up, 61 ± 20%; Forward step-up, 62.7 ± 18.2%; prone, 38 ± 22.2%) ($p<0.001$). The GMax was recruited to the greatest extent during prone 10 RM hip extension (prone, 108.7 ± 14.5%, vs. forward step-up, 28.7 ± 18.7%; lateral step-up, 31 ± 19.8%; side-lying, 38 ± 23.3%)($p<0.001$).

Discussion: These results suggest that performing a 10 RM NWB exercise results in greater muscle activation than two functional WB exercises without load in young, healthy individuals. In addition, forward and lateral step-ups failed to effectively recruit the GMax at a high enough level to achieve a strengthening stimulus. The GMed was recruited to a higher extent than the GMax during the stepping tasks which might be further augmented if the activity is performed with an additional external load.

Key Words: Electromyography, functional, hip strengthening

Level of Evidence: III

[1] University of New England College of Osteopathic Medicine, Biddeford, ME, USA
[2] University of Connecticut School of Medicine, Farmington, CT, USA
[3] Quinnipiac University, Hamden, CT, USA

CORRESPONDING AUTHOR
David Wallace
Quinnipiac University
275 Mt Carmel Ave
Hamden CT 06518
203-582-8224
E-mail: david.wallace@quinnipiac.edu

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둔부 근육 강화에 Weight Bearing과 Non-Weight Bearing 중에서 효과 적인 것은?

GLUTEAL MUSCLE ACTIVITY DURING WEIGHTBEARING AND NON-WEIGHTBEARING EXERCISE

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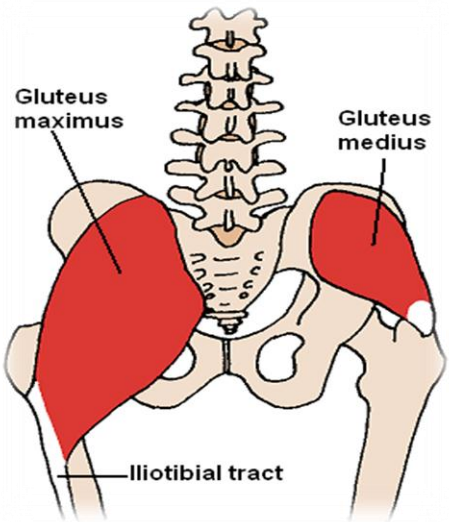
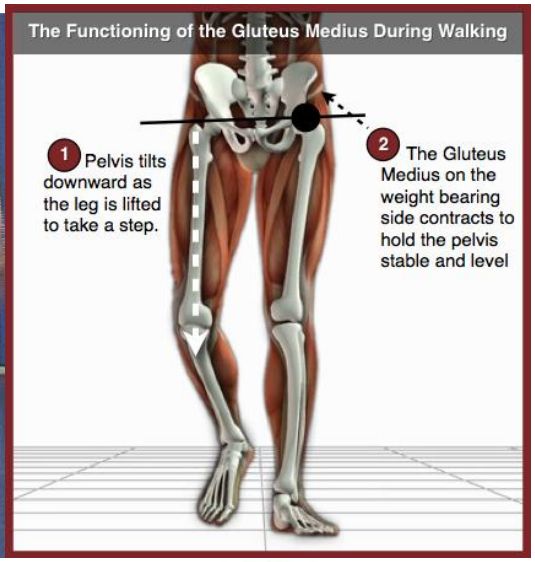
둔부 근육의 약화가 미치는 영향

Gluteus Maximus(Gmax)와 Gluteus Medius(Gmed)는 기능적 움직임을 하는 동안에 femur의 안쪽 돌림(internal rotation)과 모음(adduction)의 eccentrical control에 기여한다. 이러한 Gluteus muscle들의 약화가 무릎에 patellofemoral pain syndrome, knee arthritis등 다양한 정형적 질환을 야기시킨다는 연구들이 많이 소개되고 있다.





둔부 근육을 강화하는 연구들 중에서 side lying에서 abduction시키는 non-weight bearing의 운동들에 대한 효과와 single leg squat, squat, lunge등의 weight bearing의 운동들에 대한 효과가 연구되고 있지만 weight bearing과 non-weight bearing의 차이에 대해 비교한 논문은 없었다.

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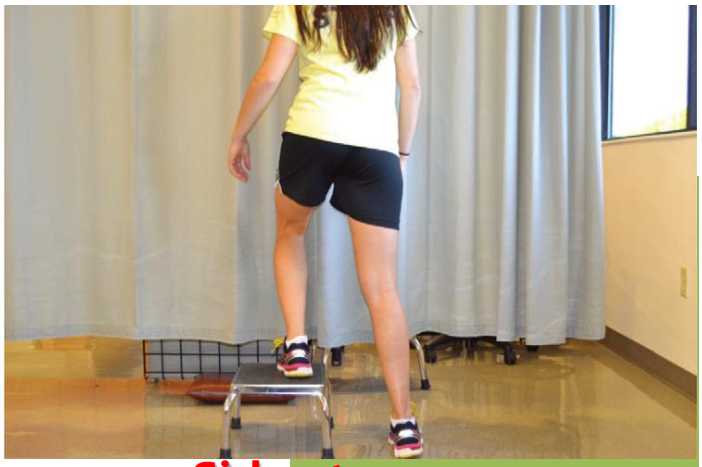
Non-Weight Bearing VS Weight Bearing: G.max and G.med

이 논문의 실험은 Gmax와 Gmed에 EMG센서를 부착시켜 4개의 운동에 따른 근전도를 확인하였다.

4개의 운동은 Weight bearing에서 2개: Forward step & Side step, Non-weight bearing에서 2개: 10RM extension & 10RM abduction 으로 진행하였다.

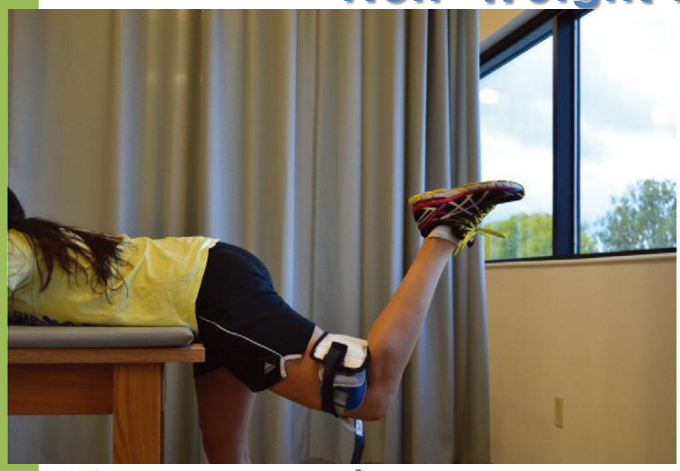
Weight Bearing

Forward step



Side step

Non-Weight Bearing



10RM extension

10RM abduction

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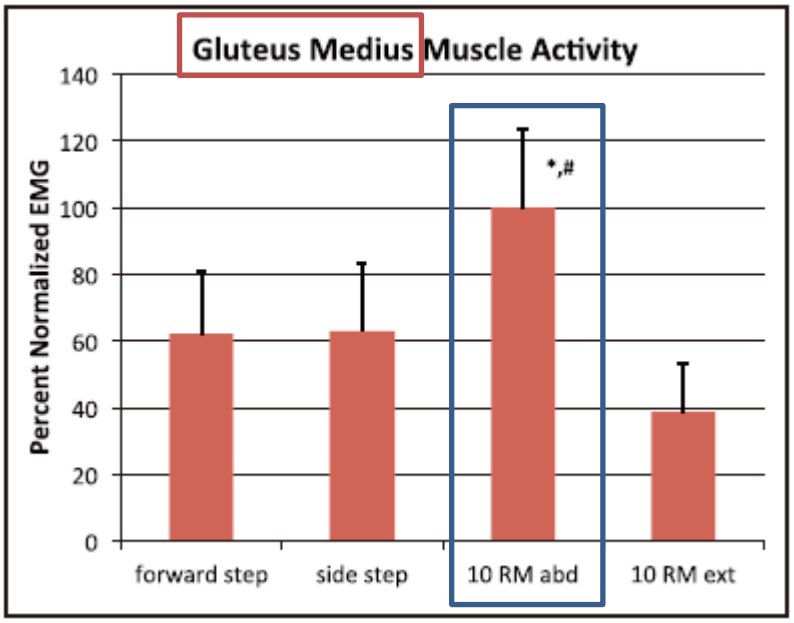
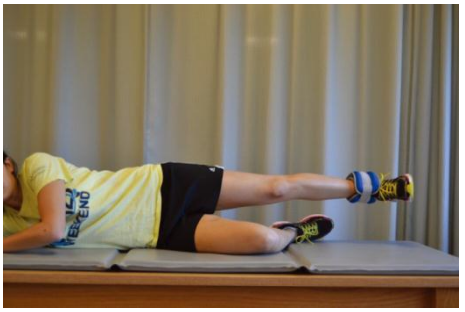
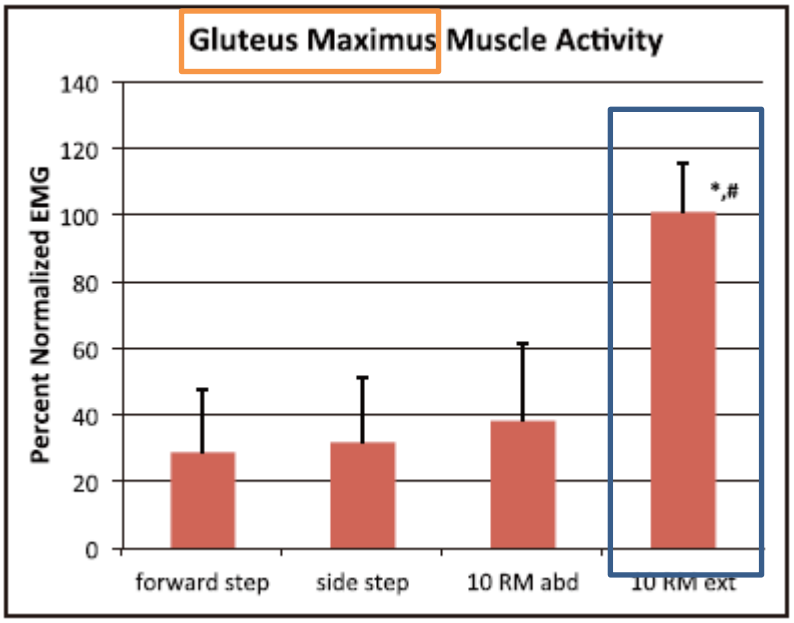
Non-Weight Bearing VS Weight Bearing 결과





Gmed에 대한 근 활성도는 sidelying에서 abduction인 non-weight bearing이 더 높았다.



Gmax에 대한 근 활성도는 prone에서 extension인 non-weight bearing이 더 높았다.

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왜 Non weight bearing이 더 많은 근활성도를 보였을까!

Gmed 근육이 non-weight bearing에서 side lying 자세에서 abduction을 시키는 것 자체가 Lever arm이 가장 길기 때문에 더 많은 근활성도를 요구되었을 것이라고 말하고 있고 이는 잠제적으로 힘을 증진시키는데 도움이 될 것이라고 저자는 주장한다. .

또한 Gmax의 경우 non-weight bearing에서 prone자세에서 extension을 시키는 것이 더 집중적으로 Gmed를 자극하는 운동이라고 주장하고 있다 그 이유는 hip flexion angle이 증가 됨에 따라 external rotator로 Gmax의 작용이 증가하지만 hip flexion이 0도일 때는 external rotator로 Gmed와 piriformis가 사용되기 때문에 Weight bearing의 움직임에서 Gmax를 선택적인 강화가 어렵다고 저자는 말하고 있다.

그러므로 저자는 10RM수준의 Non weight bearing 상태의 exercise가 Weight bearing 상태의 기능적 움직임인 Forward, lateral step보다 둔부 근육을 자극하는데 더 효과적이다라고 제시하고 있다.

따라서 "둔부 근육을 자극하는데 non-weight bearingr과 weight bearing중에 어떤 것이 효과적일까?" 에 대한 질문에 근골격계 전문가인 우리의 답변은

"Non-weight bearing이 둔부근육을 선택적으로 자극하는데 효과적일 수 있다."

라고 이 논문을 근거로 이야기 할 수 있을 것이다.

-KEMA 책임 연구원 황의재-

-문의사항은 KEMA 홈페이지 기사에 댓글로 남겨주세요-

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