

**Abstract**

**The Effect of Knee Exercises on the Onset Time of Vastus Medialis Oblique and Vastus Lateralis Muscle.**

**Kim Myoung-jin, M.Sc., P.T.**

Dept. of Physical Therapy, Yeoungdong College

**Kim Ji-won, M.Sc., P.T.**

Dept. of Anatomy, Wonju College of Medicine, Yonsei University

**Lee Jae-on, B.H.Sc., P.T.**

Dept. of Physical Therapy, Saeroun Hospital

**Park Kyoung-hee, B.H.Sc., P.T.**

**Shin Hwa-kyoung, B.Sc., P.T.**

Dept. of Rehabilitation Therapy, The Graduate School, Yonsei University

The purpose of this study was to investigate the effect of knee exercises on the onset times of vastus medialis oblique muscle (VMO) and vastus lateralis muscle (VL) and in healthy subjects. Fifteen subjects (7 men, 8 women) in a mean age of 26.4 years participated in the study.

Electromyographic (EMG) signals were recorded from the VMO and VL under four exercises. Knee exercises consisted of open kinematic terminal knee extension, straight leg raising, isometric hip adduction exercise, and closed kinematic terminal knee extension. No significant differences were found in the onset times of EMG activities of VMO and VL in the four exercises. There were also no significant differences among the exercises. These results coincided with previous studies that found no difference between onset of VMO and VL. However, it is difficult to say that there is no difference between onset of VMO and VL in healthy subjects. To confirm this results, further researches that follow same onset determination method

and exercises are needed. Not only is the study of onset time of muscle needed, but also the studies of the amount of activation and the rate of increase of muscle activation are needed.

**Key Words:** Patellofemoral pain; Onset time; Knee exercise.

가  
· Gilleard (1998)  
(patellofemoral pain  
syndrome) 가  
( , 1999; Powers ,  
1996),  
, 가  
(Callaghan  
Oldham, 1996; Powers , 1996).  
(quad-  
ricpes muscle)  
가 (subluxation) 가  
,  
(vastus medialis oblique) 가  
(vastus lateralis) (Gilleard , 1998).  
(Levin , 1983; Welsh Woodall,  
1990). 가  
(onset time) ,  
(Gilleard , 1998; Witvrow , 1996). 가  
가  
(Gilleard , 1998).  
Witvrouw (1996) (knee  
reflex) 가  
1.  
가  
Karst Willet(1995) 23 31 . 15  
Powers (1996)



(onset time difference: OTD; 가

hip adduction exercise)

3 5 )

60° , 30°

가

가

5

4)

(Closed kinematic terminal knee extension)

30°

(ischial tuberosity)

5

4.

SAS version 6.12

.05

30

. 1) 2)

(OTD)

3 kg

1), 2), 3)

, 4)

(two-way ANOVA)

1)

(Open kinematic terminal knee extension)

1.

30°

26.4 ,

59.6 kg,

166.3 cm ,

7 , 8 ( 1).

2)

(Straight leg raising)

2.

가

2

가

(OTD)

3)

(Isometric

1. (n=20)

	±		
( )	26.4 ± 2.4	23	31
(kg)	59.6 ± 9.8	45.0	78.0
(cm)	166.3 ± 7.6	158.0	178.0

1), 2), 3)

4)

(Fulkerson  
 Shea, 1990; Holmes Clancy, 1998;  
 Insall, 1982). Lieb Perry (1968)

3.

가

(OTD)

.6467

가 ( 2).

가

2.

	F
3	2.87 .96 .56
14	.01 .00 .00

(squatting), (kneeling)

(Brukner Khan, 1993),  
 (weakness),  
 (Henry Crosland, 1979).

3.

	(sec)
1	.0277 ± .0514
2	.0258 ± .1206
3	.0089 ± .0853
4	-.0008 ± .1426

(Holmes Clancy, 1998; Fulkerson  
Shea, 1990),  
(Outbridge, 1964),  
가  
(Levin, 1979).  
가  
, 3  
(tracking) ( 15 4 )  
(Fulkerson  
Shea, 1990).  
가 가 (Callaghan Oldham, 1996).  
(Insall, 1982;  
Voight Weider, 1991). , (adductor magnus)  
가  
(Hanten Schulthies, 1990; Levin  
, 1983). 0  
30 가  
가 가 , 15 30  
(Francis Scott,  
1974).  
가 (Grabiner  
, 1994). ,  
가  
(Grabiner , 1994; 가  
Karst Willet, 1995; Morrish Woledge,  
1997; Power , 1996; Sheehy , 1998; 가 .  
Voight Weider, 1991). 가 가  
가 (Karst Willet, 1995; Powers  
, 1996).  
Voight Weider(1991), Witvrouw  
(1996)  
가  
(DiFabio, 1987; Powers , 1996; Voight  
Weider, 1991). 가  
, Karst Willet(1995)  
, 가 가  
, Powers (1996) , 가  
(Scuderi , 1992). 가



- alignment. *J Bone Joint Surg Am.* 1990;72:1424-1429
- Gilleard W, McConnell J, Parsons D. The effect of patellar taping on the onset of vastus medialis obliquus and vastus lateralis muscle activity in persons with patellofemoral pain. *Phys Ther.* 1998;78:25-32.
- Grabiner MD, Koh TJ, Draganich LF. Neuro-mechanics of the patellofemoral joint. *Med Sci Sports Exerc.* 1994;5:69-85.
- Hanten WP, Schulthies SS. Exercise effect on electromyographic activity of the vastus lateralis muscle. *Phys Ther.* 1990;70:561-565.
- Henry JH, Crosland JW. Conservative treatment of patellofemoral subluxation. *Am J Sports Med.* 1979;7:12-14.
- Holmes SW, Clancy WG. Clinical classification of patellofemoral pain and dysfunction. *J Orthop Sports Phys Ther.* 1998;28:299-306.
- Insall J. Current concepts review: Patellar pain. *J Bone Joint Surg Am.* 1982;64:147-152.
- Karst GM, Willet GM. Onset timing of electromyographic activity in the vastus medialis oblique and vastus lateralis muscles in subjects with and without patellofemoral pain syndrome. *Phys Ther.* 1995;75:813-823.
- Levin J. Chondromalacia patellae. *The Physician and Sportsmedicine.* 1979;7:41-49.
- Levin TA, Medeiros JM, Reynolds L, et al. EMG activity of the vastus medialis oblique and the vastus lateralis in their role in patellar alignment. *Am J Phys Med.* 1983;62:61-70.
- Lieb FJ, Perry J. Quadriceps function. *J Bone Joint Surg Am.* 1968;50:1535-1548.
- Morrish GM, Woledge RC. A comparison of the activation of muscles moving the patella in normal subjects and in patients with chronic patellofemoral problems. *Scand J Rehabil Med.* 1997;29:43-48.
- Outbridge RE. Further studies on the etiology of chondromalacia patellae. *J Bone Joint Surg Br.* 1964;46:179-190.
- Powers CM, Landel R, Perry J. Timing and intensity of vastus muscle activity during functional activities in subjects with and without patellofemoral pain. *Phys Ther.* 1996;76:946-955.
- Scuderi GR, Taffel CB, Iappala FG. Rehabilitation of patellofemoral joint disorder. *Orthop Clin North Am.* 1992;23(4):555-566.
- Sheehy P, Burdett RC, Irrgang JJ et al. An electromyographic study of vastus medialis oblique and vastus lateralis activity while ascending and descending steps. *J Orthop Sports Phys Ther.* 1998;27:423-429.
- Voight M, Weider D. Comparative reflex response times of the vastus medialis and the vastus lateralis in normal subjects and subjects with extensor mechanism dysfunction. *Am J Sports Med.* 1991;10:131-137.
- Welsh JA, Woodall W. A biomechanical basis for rehabilitation programs involving the patellofemoral joint. *J Orthop Sports Phys Ther.* 1990;11:535-542.
- Witvrouw E, Sneyers O, Lysen R, et al. Reflex response times of vastus medialis oblique and vastus lateralis in normal subjects and in subjects with patellofemoral pain syndrome. *J Orthop Sports Phys Ther.* 1996;24:160-165.