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Interesting Articles for KEMA Members

ORIGINAL ARTICLE

Comparing Biofeedback With Active Exercise and Passive Treatment for the Management of Work-Related Neck and Shoulder Pain: A Randomized Controlled Trial

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ABSTRACT. Ma C, Szeto GP, Yan T, Wu S, Lin C, Li L. Comparing biofeedback with active exercise and passive treatment for the management of work-related neck and shoulder pain: a randomized controlled trial. Arch Phys Med Rehabil 2011;92:849-58.

Objectives: To compare the effects of biofeedback with those of active exercise and passive treatment in treating work-related neck and shoulder pain.

Design: A randomized controlled trial with 3 intervention groups and a control group.

Setting: Participants were recruited from outpatient physiotherapy clinics and a local hospital.

Participants: All participants reported consistent neck and shoulder pain related to computer use for more than 3 months in the past year and no severe trauma or serious pathology. A total of 72 potential participants were recruited initially, of whom a smaller group of individuals (n=60) completed the randomized controlled trial.

Interventions: The 3 interventions were applied for 6 weeks. In the biofeedback group, participants were instructed to use a biofeedback machine on the bilateral upper trapezius (UT) muscles daily while performing computer work. Participants in the exercise group performed a standardized exercise program daily on their own. In the passive treatment group, interferential therapy and hot packs were applied to the participants' necks and shoulders. The control group was given an education booklet on office ergonomics.

Main Outcome Measures: Pain (visual analog scale), neck disability index (NDI), and surface electromyography were assessed preintervention and postintervention. Pain and NDI were reassessed after 6 months.

Results: Postintervention, average pain and NDI scores were reduced significantly more in the biofeedback group than in the other 3 groups, and this was maintained at 6 months. Cervical erector spinae muscle activity showed significant reductions postintervention in the biofeedback group, and there were consistent trends of reductions in the UT muscle activity.

Conclusions: Six weeks of biofeedback training produced more favorable outcomes in reducing pain and improving muscle activation of neck muscles in patients with work-related neck and shoulder pain.

Key Words: Feedback; Electrical stimulation; Exercise; Neck pain; Rehabilitation; Shoulder pain.

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COMPUTER USE DOMINATES work and permeates home and school environments in modern society. It is estimated that 90% of office workers use computers daily, with 40% reporting use for at least 4 hours per day.[1] Such intensive use can greatly increase the risk of musculoskeletal disorders,[1,2] and indeed, prevalence rates of work-related neck and shoulder disorders have increased considerably among office workers over the past few decades.[3] Among the factors that may influence these disorders is the sustained and increased activity of major stabilizing muscles such as the trapezius in maintaining prolonged static posture.[4]

Although research literature[4-8] has supported the positive effects of exercise training and physical activity in managing musculoskeletal disorders, the underlying mechanisms are still not clear. Prolonged computer work may lead to static muscle tension, and this may contribute to fatiguing or overloading of postural muscles, resulting in pain and degenerative changes in these muscles.[4,9,10] If this is the main cause of work-related neck and shoulder pain, then regular exercise or physical activity should help to relieve pain by alleviating static muscle tension. However, many individuals tend to have fairly fixed postural habits, and they may resume work with the same static posture and muscle tension after taking an exercise break. Work in our laboratory[11] has shown that high levels of trapezius muscle activity are elicited as soon as workers place their hands on the keyboard, even before any work begins. These results suggest that habitual maladaptive motor control patterns are crucial mechanisms contributing to the development of work-related musculoskeletal disorders (WMSDs).

Recent research studies have found that biofeedback can be applied to reduce muscular tension in order to treat

List of Abbreviations

ANOVA	analysis of variance
CES	cervical erector spinae
EMG	electromyogram
NDI	Neck Disability Index
RCT	randomized controlled trial
UT	upper trapezius
VAS	visual analog scale
WMSDs	work-related musculoskeletal disorders

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Supported by a research grant from Hong Kong Polytechnic University (grant no. A-PH83).

Presented to the International Society of Electromyography and Kinesiology, June 16–19, 2010, Aalborg, Denmark.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit on the authors or on any organization with which the authors are associated.

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0003-9993/10/9206-00853$36.00/0
doi:10.1016/j.apmr.2010.12.037

목, 어깨 통증관리

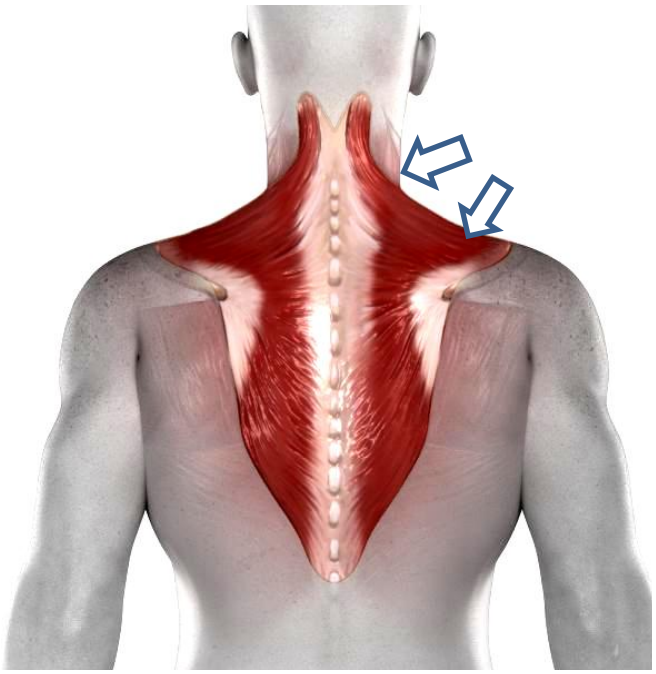
효율적인 방법이 무엇일까?

Comparing Biofeedback With Active Exercise and Passive Treatment for the Management of Work-Related Neck and Shoulder Pain: A Randomized Controlled Trial

Arch Phys Med Rehabil. 2011 Jun;92(6):849-58.

목과 어깨 통증 (Neck & Shoulder pain)

현대사회에는,
컴퓨터를 오래 사용
하므로써 근·골격계 질환의
위험성이 증가하고 있으며,



특히, 컴퓨터 작업을 오래할 수록, 키보드를 많이 사용 할 수록 등세모근(trapezius)와 목폄근(cervical erector spinae)의 근육 활성도는 증가되며 이는 목과 어깨에 통증들을 유발 시킬 수 있다.

이에 따라, 치료사들은 환자들이 목을 과도하게 펴지 말고, 위등세모근(upper trapezius)을 과도하게 사용하지 않을 것을 권장한다.

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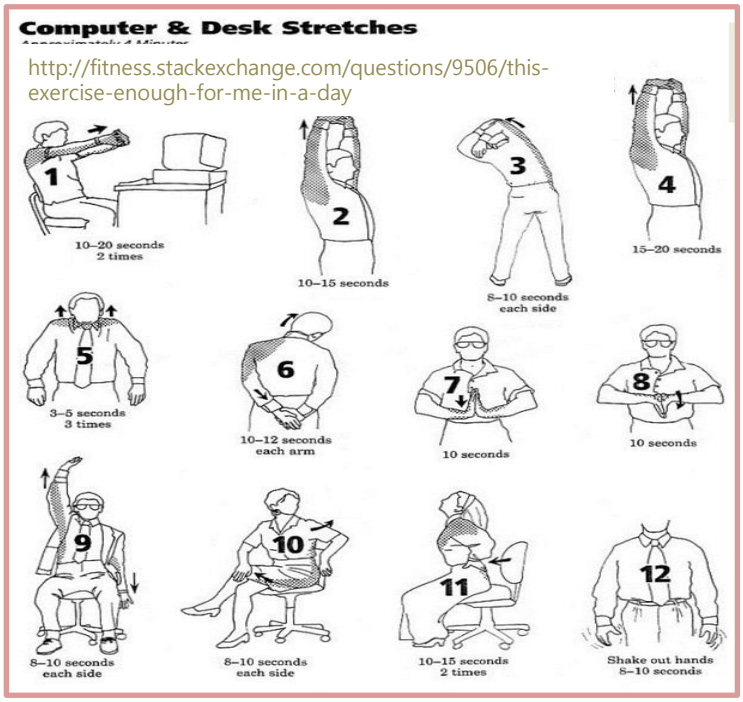
목폄근과 위등세모근에 근활성도를 낮춰 목-어깨 통증을 감소 시키는 데는 여러가지 방법이 있다.

1. Biofeedback 시스템을 이용한 방법.



2. Active exercise

혼자 스스로 하는 목-어깨 위주의 운동을 이용한 방법.

3. Passive treatment

핫팩과 전기치료를 이용한 방법.

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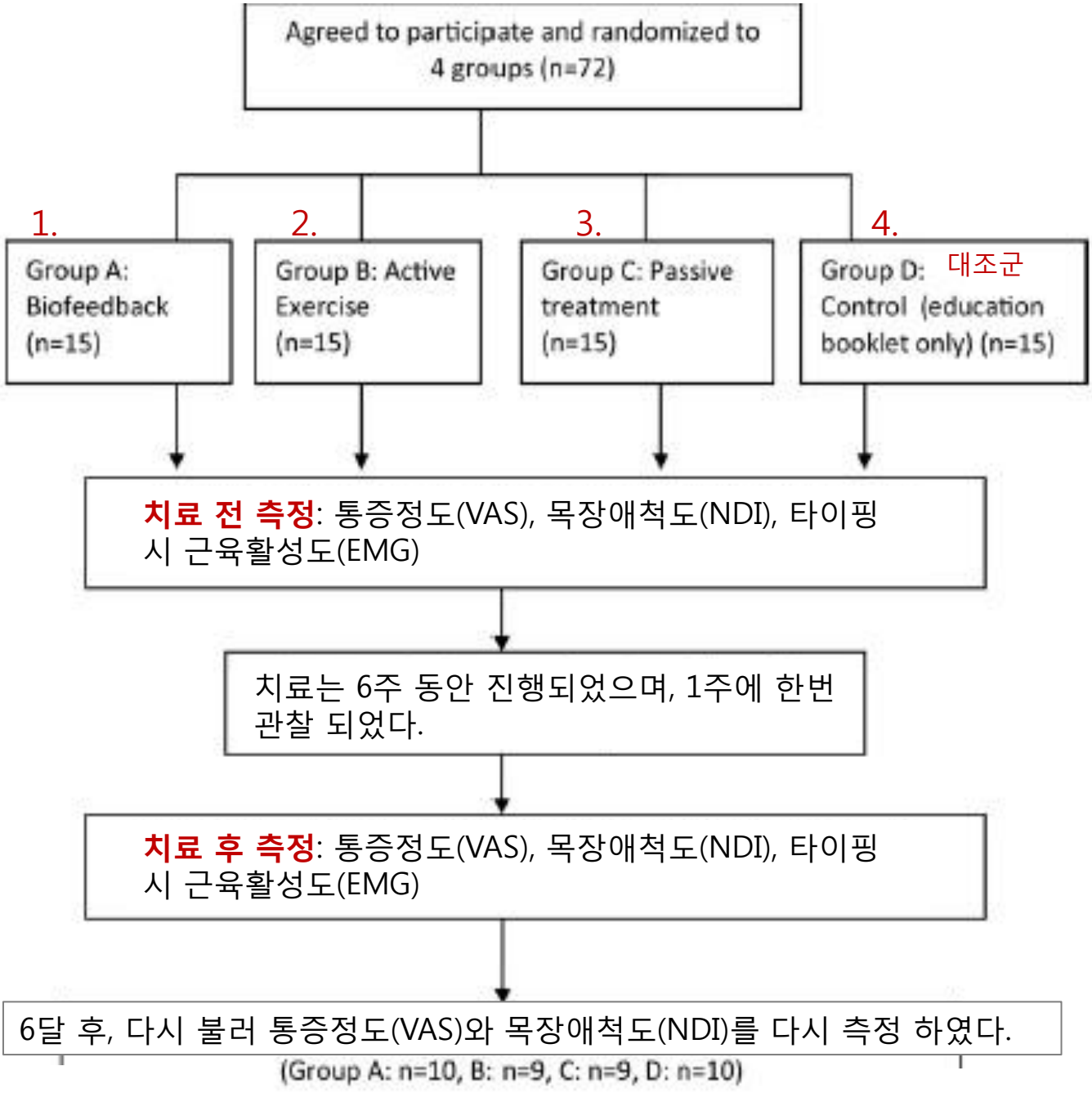
일과 관련된 목 통증을 가진 72명을 4그룹으로 나누어 각 방법들을 적용시켰다.



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1. Biofeedback group (15명)

-부착위치: 양쪽 UT.
-방법 : 컴퓨터 작업을 하는 동안 하루의 2시간 동안 일주일에 2번 이상 사용 되었다.
-역치가 넘어가면 소리 feedback 신호 알림을 통해 대상자가 UT에 힘을 빼고 어깨를 relax하도록 하였다.

Upper Trapezius

2. Active exercise group (15명)

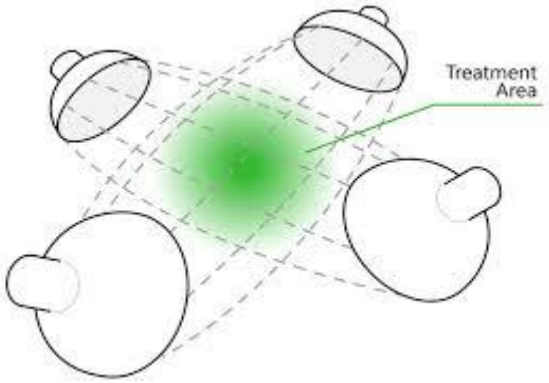
Table 1: List of Exercises and Dosage for the Active Exercise Group

Exercise	Starting Position	Description
1	Sitting	Active movements of the neck into flexion/extension, side flexion, and rotation to each side
2	Standing	Active shoulder stretching into full flexion (stretch both arms above the head toward the ceiling)
3	Standing	Active stretching of the shoulder across the chest in horizontal adduction (do one arm first, then the other arm)
4	Standing	Holding a weight in your hand (about 1 kg), make a full circle of the whole arm (circumduction of the shoulder joint)
5	Standing	Active lumbar extension
6	Lying or sitting	Active lumbar flexion (Hug the knees and pull the knees up to the chest) to stretch the back muscles
7	Standing	Resisted shoulder elevation exercise with Thera-band
8	Sitting	Resisted shoulder elevation exercise with Thera-band
9	Sitting	Resisted shoulder elevation exercise with Thera-band
10	Sitting	Resisted shoulder elevation exercise with Thera-band

1. 앉아서 목의 굽힘, 폄, 옆으로 굽힘, 돌림 등을 시행한다.
2. 일어나서 어깨의 굽힘, 가로질러 수평 모음 등을 시행한다.
3. 아령을 들고 어깨 관절 전체를 이용하여 원을 그려 어깨를 풀어준다.
4. 선 자세에서 허리를 펴고 굽힌다.
5. 서고, 앉은 상태에서 세라밴드를 이용해 어깨 올림 운동을 시행한다.

3.Passive treatment group (15명)

-부착위치: 양쪽 어깨(UT)와 목뒤부분
-전기치료는 20분, 핫팩은 15분씩 일주일에 2번 적용한다.



4. Control group (15명)

기본 인체공학 교육용 책자만 제공한다.

결과

1. 목 장애 정도(NDI)와 목통증 정도(VAS)

Table 4: Preintervention and Postintervention Comparisons of VAS and NDI Between and Within the 4 Groups

Group	Group A: Biofeedback (n=15)	Group B: Active Exercise (n=15)	Group C: Passive Treatment (n=15)	Group D: Control (n=15)
NDI-pre	16.82±6.21	16.05±5.13	15.81±4.97	16.53±5.95
NDI-post	7.00±3.05*†‡§	10.33±2.23*†	12.33±4.29*†	14.82±2.87
VAS-pre	5.12±1.65	4.75±1.59	5.69±1.54	5.27±1.27
VAS-post	1.87±0.74*†‡§	2.10±1.34*†‡	3.60±1.18*†	4.75±1.53

→ 대조군을 제외한 모든 세그룹에서 유의한 감소를 보였다.

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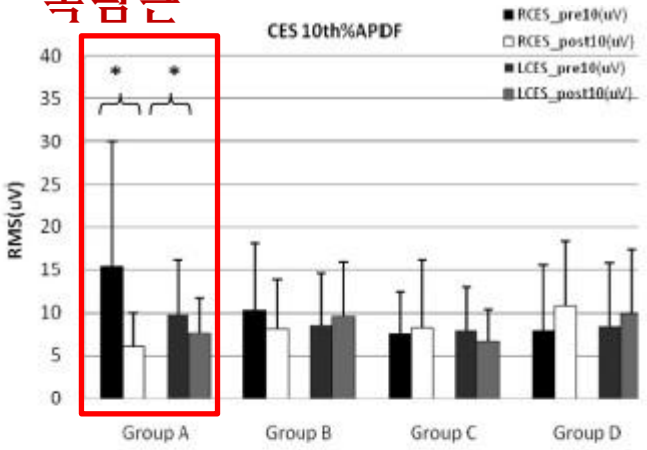
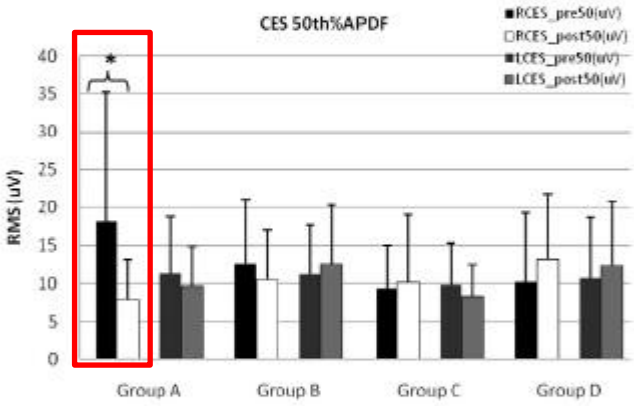
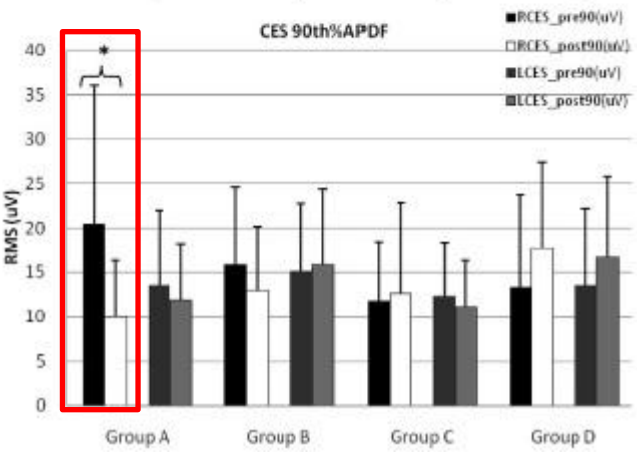
2. 목폄근과 등세모근의 근육 활성도

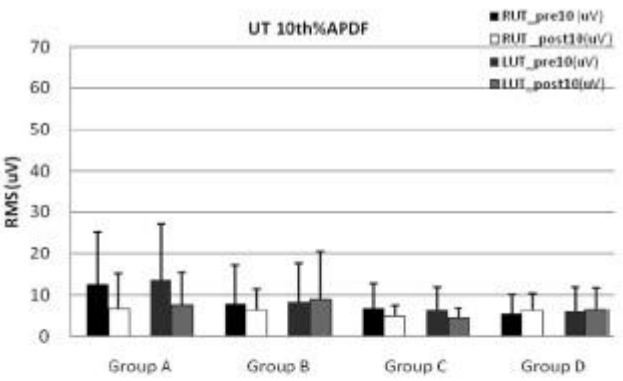
목폄근

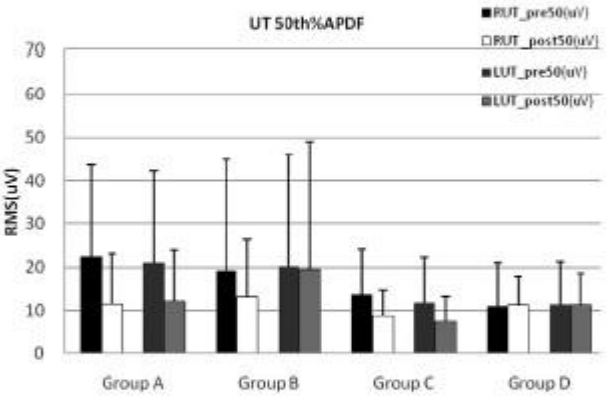


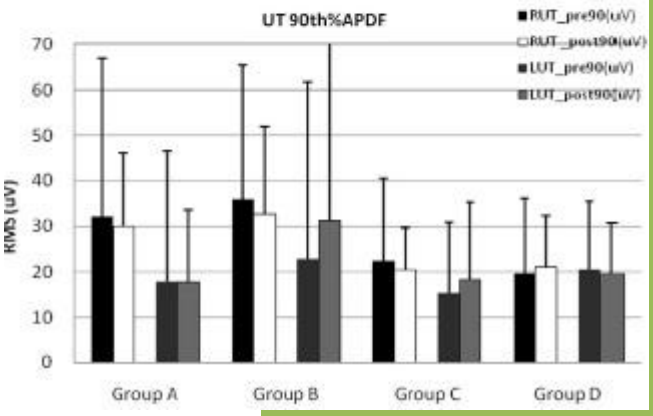




위등세모근







→목폄근(CES)의 Biofeedback 그룹에서만 유의한 감소를 보였다.

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3. NDI와 VAS의 6주 후, 6달 후 의 그룹간 비교

Table 5: NDI and VAS Results at 6-Month Follow-Up

Outcome Measure	Time Interval	Group A: Biofeedback (n=10)	Group B: Active Exercise (n=9)	Group C: Passive Treatment (n=9)	Group D: Control (n=10)	1-Way ANOVA *P*	Post Hoc Comparison‡	LSD *P*
NDI	Baseline†	16.20±4.56	17.00±4.38	16.88±3.98	16.60±3.71	.976		
목 장애 척도	6 wk†	7.50±2.83	11.30±2.59	13.55±2.18	16.40±2.59	.000*	A vs B	.003*
							A vs C	.000*
							A vs D	.000*
							B vs C	.076
							B vs D	.000*
							C vs D	.012*
	6 mo	7.70±2.79	11.88±2.36	15.55±2.87	16.7±2.94	.000*	A vs B	.001*
							A vs C	.000*
							A vs D	.000*
							B vs C	.008*
							B vs D	.002*
							C vs D	.382
VAS	Baseline†	5.40±1.50	5.61±0.85	5.70±1.39	5.59±0.96	.936		
목 통증 정도	6 wk†	1.52±0.53	3.44±0.46	3.77±1.09	5.15±1.33	.000*	A vs B	.000*
							A vs C	.000*
							A vs D	.000*
							B vs C	.455
							B vs D	.000*
							C vs D	.003*
	6 mo	1.70±0.63	3.70±0.90	5.05±1.23	5.70±1.16	.000*	A vs B	.000*
							A vs C	.000*
							A vs D	.000*
							B vs C	.011*
							B vs D	.000*
							C vs D	.173

결과

→ NDI와 VAS에서 모두 Biofeedback 그룹에서 다른 그룹에 비해 유의하게 감소 했음을 알 수 있다.

→ 대조군과 비교하여 모든 그룹에서 NDI와 VAS가 유의하게 감소했음을 알 수 있다.

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목과 어깨의 통증을 관리 하기 위한 여러 가지 방법들이 알려져 있지만, 컴퓨터를 오래 사용하는 사람에게 biofeedback을 적용하면 목과 어깨의 통증을 감소 시키는데 효과 적일 수 있다.

어깨를 관리하는 방법은 다양하다.

하지만 환자가 스스로 자세를 고칠 수 있도록 biofeedback을

적용 한다면,

전반적으로 목, 어깨 통증을 효율적으로 감소하는데

도움이 될 것이다.

라고 이 논문을 근거로 이야기 할 수 있을 것이다.

-KEMA 책임 연구원 김현아-

-문의사항은 KEMA 홈페이지 기사에 댓글로 남겨주세요-

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