

INTRODUCTION

In the human body the skeletal muscle tissue is the more abundant accounting for between 40 and 45% of its total weight. The body has more than 430 skeletal muscles which are distributed in pairs on both sides.

The most vigorous movements are triggered by less than 80 pairs of muscles on both sides of the body.

These muscles give strength and protection to the skeleton distributing the weights and absorbing impacts: they allow the muscles to move on their joints and to maintain the body posture/stance against a force. These abilities normally represent the action of muscle groups, not of individual muscles.

Using girdles for a long period of time produces a relaxation of the skeletal muscle which reduces its contraction capacity, and which causes an alteration of the muscular trophism (the tiny myofibers that made up the muscle). The more affected muscles, because of their morphology, are the abdominal ones.

EVAPAT has developed a lumbar bodysuit made with natural fabrics like SUPIMA® cotton, X-STATIC® silver fiber and elastane LYCRA®. This garment allows you to maintain the activating capacity of the skeletal muscle system without causing atrophy.

PURPOSE OF THE STUDY

The purpose of this study is to evaluate LUMBARWEAR®, a garment developed to protect the lumbar area while exercising.

The point is to record the paravertebral lumbar and abdominal muscle system while exercising and to assess if it maintains the muscle activity when this garment is used.

METHOD

Individuals

We have studied 4 people - 2 men and 2 women, with an average age of 32. They are healthy and have a mildly active sedentary/active life patterns. These individuals have been chosen in order to adequate them to the prospective average buyer of the product.

Equipment

The activity is recorded by means of a surface electromiograph Mega ME6000.

The electrodes used are Ag/AgCl.

The skin has previously been cleaned up with alcohol. The electrodes are fixed in the abdominal muscles in parallel to the fibers.

Design of the experiment

We monitor the muscular activity of the rectus abdominis and major abdominal oblique while four different abdominal exercises are performed (Figure 1 and 2).

- the lumbar paravertebral muscles, spine erectors and lumbar multifidus while flexo-extension exercises of the lumbar column are performed
- the abdominal muscles and lumbar paravertebral while walking

All these exercises are executed both with and without LUMBARWEAR®.

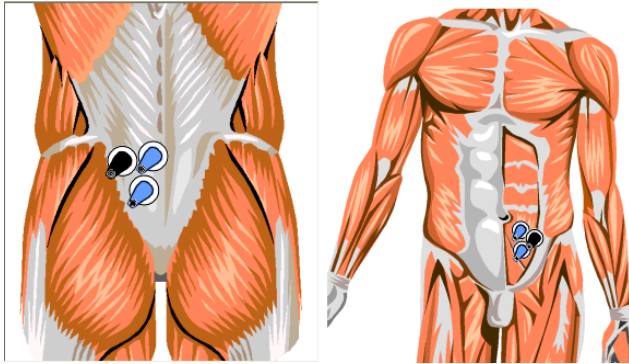


Figure 1: Muscles and disposition of the electrodes.

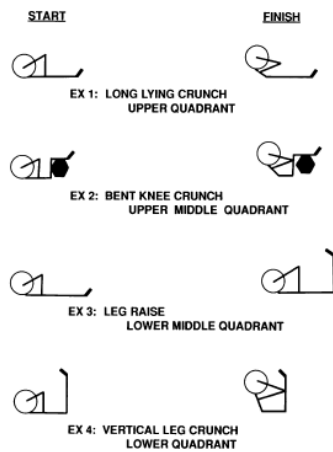


Figure 2: Performance of the exercises

RESULTS:

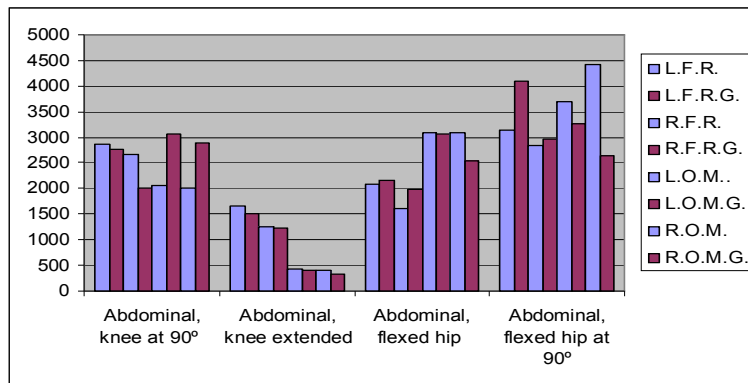
The results of these abdominal exercises, performed with and without LUMBARWEAR®, show that the use of this lumbar girdle does not reduce the capacity of the muscles, which maintain their contraction power, and does not cause any atrophy while being very comfortable to use.

We consider that there are no significant differences when these are less than 20 % when the exercises are performed with or without LUMBARWEAR®. This is the valid criteria when an isotonic contraction is made, and we assess the activity performed between an extremity and its counter lateral. It is also valid in our study, with and without LUMBARWEAR®.

1.a . While performing abdominal exercises in men the average muscular activity recorded is:

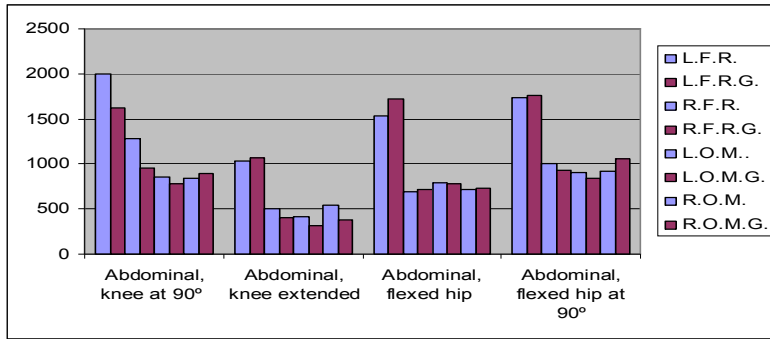
	L.F.R.	L.F.R.G.	R.F.R.	R.F.R.G.	L.O.M.	L.O.M.G.	R.O.M.	R.O.M.G.
Abdominal, knee at 90°	2856	2765	2663	2015	2052	3057	2013	2884
Abdominal, knee extended	1659	1499	1258	1239	438	392	391	334
Abdominal, flexed hip	2074	2156	1598	1974	3100	3066	3099	2544
Abdominal, flexed hip at 90°	3129	4094	2851	2961	3706	3273	4411	2647

- *L.F.R. (left front rectus); L.F.R.G. (left front rectus with girdle); R.F.R. (right front rectus); RFRG (right front rectus with girdle); LOM (left oblique major); LOMG (left oblique major with girdle); R.O.M right oblique major); R.O.M.G.(right oblique major with girdle)*



1.b. While performing abdominal exercises in women the average muscular activity recorded is:

	L.F.R.	L.F.R.G.	R.F.R.	R.F.R.G.	L.O.M.	L.O.M.G.	R.O.M.	R.O.M.G.
Abdominal, knee at 90°	1999	1616	1285	956	848	784	843	896
Abdominal, knee extended	1030	1066	497	402	411	312	536	375
Abdominal, flexed hip	1534	1724	691	712	787	785	713	733
Abdominal, flexed hip at 90°	1734	1755	999	926	904	840	917	1052



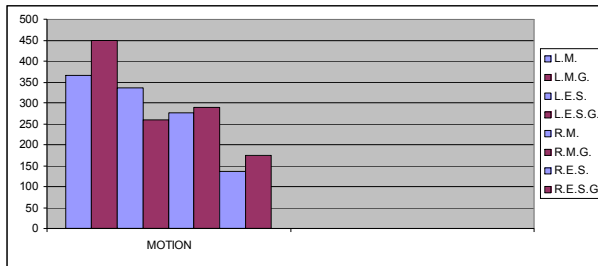
As we can see, the muscular activity while performing the different abdominal exercises does not differ more than a 20% with and without LUMBARWEAR®.

2.a. While walking/running the average muscular activity recorded for men in the paravertebral lumbar muscles is:

	L.M.	L.M.G.	L.E.S.	L.E.S.G.	R.M.	R.M.G.	R.E.S.	R.E.S.G.
MOTION	365	448	336	259	277	290	137	174

["Motion" can mean both walking and jogging]

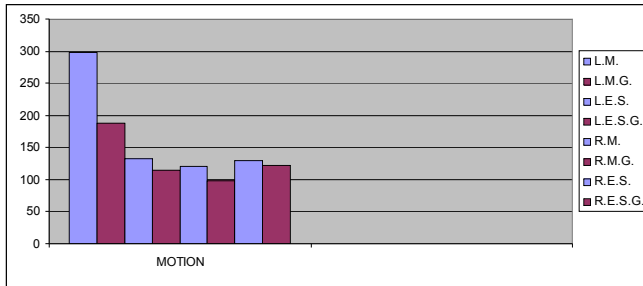
* L.M. (left multifidus); L.M.G. (left multifidus with girdle); L.E.S. (left erector spinae); L.E.S.G. (con left erector spinae with girdle); R.M. (right multifidus); R.M.G. (right multifidus with girdle); R.E.S. (right erector spinae); R.E.S.G. (right erector spinae with girdle);



2.b. While walking/running the average muscular activity recorded for women in the paravertebral lumbar muscles is:

	L.M.	L.M.G.	L.E.S.	L.E.S.G.	R.M.	R.M.G.	R.E.S.	R.E.S.G.
MOTION	298	188	132	114	121	99	129	122

["MOTION" can mean both walking and jogging]

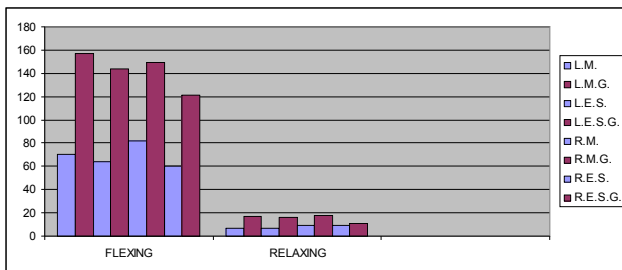


While walking a good muscular activity is observed of the paravertebral lumbar muscles without significant differences when recording the results with the LUMBARWEAR®.

3. A flexo-extension of the lumbar spine is made. When the back is flexed at between 40°- 70°, a relaxation of the paravertebral lumbar muscles appears. We intend to prove objectively that there is no loss of the activation capacity while flexing nor relaxation in the indicated parameters.

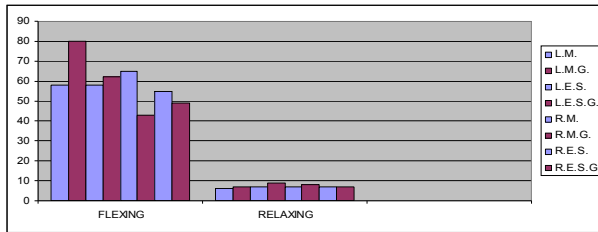
3.a. The average activity for men while flexing and relaxing the paravertebral muscles is:

	L.M.	L.M.G.	L.E.S.	L.E.S.G.	R.M.	R.M.G.	R.E.S.	R.E.S.G.
FLEXING	70	157	64	144	82	149	60	121
RELAXING	7	17	7	16	9	18	9	11



3.b. The average activity for women while flexing and relaxing the paravertebral muscles is:

	L.M.	L.M.G.	L.E.S.	L.E.S.G.	R.M.	R.M.G.	R.E.S.	R.E.S.G.
FLEXING	58	80	58	62	65	43	55	49
RELAXING	6	7	7	9	7	8	7	7



While performing flex-extension exercises of the lumbar spine a good activity of the paravertebral lumbar muscles is recorded, with no significant differences when using LUMBARWEAR®. When the back is flexed at between 40°- 70°, a relaxation of the par vertebral lumbar muscles appears, but there is no loss of the activation capacity while flexing nor relaxation in the indicated parameters.

CONCLUSIONS

The technical features of LUMBARWEAR® are such that make this garment comfortable without altering the contracting capacity of the paravertebral lumbar and abdominal muscles nor causing atrophy of them.

While performing abdominal exercises the contracting capacity of the abdominal muscles is maintained, even recording better muscle contraction in some exercises when using LUMBARWEAR®.

In walking exercises a good activity of the Para vertebral lumbar muscles is recorded without significant differences when using LUMBARWEAR®.

In the flexo-extension exercises of the lumbar spine a good activity of the paravertebral lumbar muscles is recorded without significant differences when using LUMBARWEAR®. There is no loss of the activating capacity while flexing or relaxing in the indicated parameters.



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