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RESEARCH ARTICLE

INVESTIGATION OF TRIGGER POINTS BY ALGOMETER

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ABSTRACT

The Purpose of The Study: Was to apply algometry to 29 trigger points during a study to prevent back pain in teachers. **Materials and Methods:** The initial phase of the assessment of the pain we used an handheld Algometer ALGO-AN in 65 teachers, 58 (89.2%) female and 7 (10.8%) male. The average age was 49.91 years (from 24 to 70 years). Results from a total of 58 points on the left and on the right were collected and statistically processed in April - May 2019. Data were descriptively analyzed with SPSS 25 (mean \pm standard deviation). **Results:** Analysis of the average values and variability of points with normal distribution showed that the majority of subjects with a response were at points 21, 22, 23 and 25 (left and right). The point of greatest response was 23. Points where the normal distribution was unilateral were: 4, 8, 25 and 29. We noted that for the points with more pronounced negatively skewed uniform distribution, the values of the median differed significantly from the values of the arithmetic mean (points 7 right, 10, 15, 16, 17, 25 right, 29 right). This confirmed the fact that the accumulation of values has shifted to smaller results and at these points subjects had a more pronounced sense of pain. Point without reaction was 5. The unilateral response was measured in the following points: 1, 6, 20, 26. **Discussion:** In the prevention of back pain, it is important to identify effective ways of accurate examination in a timely manner before the subjects become patients. In order to improve the diagnostic, we must look beyond the clinical tests to also additional methods and data to manage the prevention of the back pain. In this aspect, we can conclude that algometry is a method that is applicable in outpatient settings and workplaces. Our results demonstrated that the majority of teachers were with a presence of low back pain with high threshold and moderate levels of intensity, which is indicative of the initial stage. **Conclusion:** Back pain was a significant complain affecting the teachers. In the preventive study of back pain in teachers algometry has shown its diagnostic effectiveness with respect to intensity and localization of pain.

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INTRODUCTION

The social significance and widespread problem of back pain provokes us to look for symptoms and changes before subjects visit a specialist and request treatment. We implemented our idea by developing a methodology for functional diagnosis of back pain and applied it in the workplaces of teachers. To improve the precision of the diagnosis, we focused on the use of an algometer, an instrument for determining sensitivity to pain produced by pressure. We traced our experience of introducing for the first time in Bulgaria into the physiotherapy practice of algometry in our previous article (Kolev and Tasheva 2019). In the second one we compared the early results between 5 trigger points on the both sides. (Tasheva and Kolev 2019).

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The Purpose of The Study: Was to apply algometry to 29 trigger points during a study to prevent back pain in teachers.

MATERIALS AND METHODS

The initial phase of our study involved 91 teachers from three schools in Sofia. In an effort of the assessment of the pain we used an handheld Algometer ALGO-AN in 65 teachers, 58 (89.2%) female and 7 (10.8%) male. The average age was 49.91 years (from 24 to 70 years). Results from a total of 58 points on the left and on the right were collected and statistically processed in April - May 2019. As a result of the application of the accepted exclusion criteria, persons were dropped after traumas, surgical interventions, orthopedic diseases and treated for back pain. Subjects were examined in a prone and supine positions and completely relaxed. They were instructed in the onset of pain and discomfort due to pressure to give a signal.

A detailed description of the procedure and protocol for measuring trigger points by algometer was presented in our previous article (Kolev and Tasheva 2019). The basic requirement was to maintain the algometer vertically (Figure 1).

The results were reported in N / cm². The algometer was applied at trigger points according to the following scheme (Figure 2).

We have numbered the trigger points in the following order:

- m. masseter
- m. trapezius
- m. deltoideus
- m. serratus anterior
- m. rectus abdominis
- m. supinator
- spina iliaca anterior superior
- m. pectineus
- m. tensor fasciae latae
- m. quadriceps femoris - rectus femoris
- m. quadriceps femoris – vastus lateralis
- m. peroneus longus
- metatarsals
- m. trapezius pars descendens
- m. splenius
- m. levator scapulae
- m. supraspinatus
- m. trapezius pars ascendens
- mm. rhomboidei
- m. triceps brachii
- m. iliocostalis lumborum
- m. quadratus lumborum
- sacroiliac joint
- m. gluteus medius
- m. piriformis
- carpal bones
- m. gastrocnemius
- m. quadratus plantae
- m. infraspinatus

RESULTS

Data were descriptively analyzed with SPSS 25 (mean ± standard deviation). Table 1 presents the results for the points with normal distribution, which is indicative of the fact that the majority of the subjects studied are close to the average level of pain at the next points. Analysis of the average values and variability of points with normal distribution in Table 1 showed that the majority of subjects with a response were at points 21, 22, 23 and 25 (left and right). The mean values of these points are also close – left 42.18±17.73 N and right 43.25±17.97 N for point 21; left 43.32±18.28 N and right 42.74±17.31 N for point 22; left 42.40±18.69 N and right 43.38±20.51 N for point 23. The point of greatest response was 23. Points where the normal distribution was unilateral were: 4, 8, 25 and 29. The points with uniform distribution of values were presented in Table 2. The average values and variability of points with uniform distribution were presented in Table 2. Considering the values of the skewness and kurtosis indicators, we found that there is uniform distribution.

Negatively – skewed distribution (left-skewed) had found in points 1, 6, 7 и 22. It showed that more of the results are in higher values. Positively – skewed (right-skewed) had found in points 10r, 13, 14, 15, 16, 18, 19, 24 r and 25 r. Lower values were more. Most subjects had reactions in point 15 (left and right) and less in point 4 right. Indicative of the results obtained with uniform distribution of values were the medians. We noted that for the points with more pronounced negatively skewed distribution, the values of the median differed significantly from the values of the arithmetic mean (points 7 right, 10, 15, 16, 17, 25 right, 29 right). This confirmed the fact that the accumulation of values has shifted to smaller results and at these points subjects had a more pronounced sense of pain. The other points with uniform distribution presented high values of median, almost equal to arithmetic mean. This fact confirms the lower sensitivity to pain at these points in the majority of subjects. Point without reaction was 5. The unilateral response was measured in the following points: 1, 6, 20, 26.

DISCUSSION

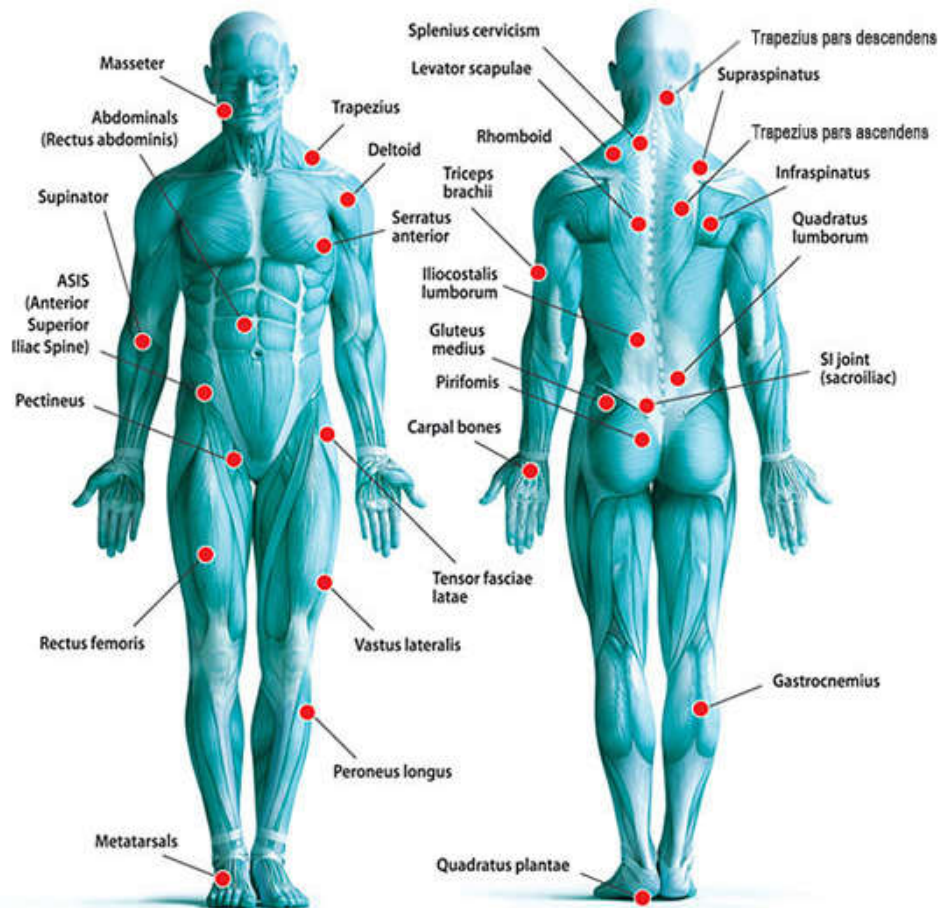
In the prevention of back pain, it is important to identify effective ways of accurate examination in a timely manner before the subjects become patients. In order to improve the diagnostic, we must look beyond the clinical tests to also additional methods and data to manage the prevention of the back pain. In this aspect, we can conclude that algometry is a method that is applicable in outpatient settings and workplaces. In our study, the results demonstrated that the majority of teachers were with a response at points 21, 22, 23 and 25 (left and right) with normal distribution. The points are of the following localization: 21 m. iliocostalis lumborum; 22 m. quadratus lumborum; 23 sacroiliac joint; 25 m. piriformis. This determines the presence a high threshold and moderate levels of intensity, which is indicative of the initial stage of low back pain. In the same time in the points with uniform distribution the most subjects had reactions in point 15 (left and right) - m. splenius.

The reliability of the algometry method has been proven in various studies (Pelfort *et al* 2015, Vučinić *et al* 2018, Więckiewicz *et al* 2015). As a result of our study, we can add also next advantages to measuring with an algometer:

- The Algometer is a portable device that can be used in a variety of environments.
- The algometer is an informative method for the presence of pain and its intensity in healthy people.
- Algometry helps to identify and locate pain points in healthy individuals as well.
- The application of the algometer at trigger points is appropriate for healthy people / teachers as it provides data on the presence of pain, because the trigger points develop as a result not only of muscular injuries and traumas, but also of strains. In cases of overloading and stretching of the muscles, tendons, ligaments and fascia, they become weak or inflamed.
- Algometer provides objectification of results and obtaining of digital values.
- The algometer enables tracking in values of progression and worsening or improvement of pain.



Figure 1. Algometer application



<https://www.amibeauty.cz/trigger-points-spousteci-body/>

Figure 2. Scheme of the trigger points

Table 1. Points with normal distribution

№	Parameters	N	Mean ± Std. dev.	V (%)	Skew	Kurt.
1	point 2 l	11	28.45±16.86	59.26	.365	-.618
2	point 2 r	11	31.00±15.91	51.32	.450	-.163
3	point 3 l	11	33.45±19.42	58.05	.122	-.681
4	point 3 r	11	34.27±14.73	42.98	-.265	.827
5	point 4 l	4	39.25±21.25	54.14	-.547	-.007
6	point 8 l	7	27.14±13.44	49.52	.201	.920
7	point 9 l	22	39.64±15.27	38.52	.325	-.150
8	point 9 r	22	37.82±15.08	39.87	.674	.169
9	point 11 l	11	40.00±20.81	52.02	.656	.444
10	point 11 r	11	39.27±14.89	37.91	-.362	.014
11	point 12 l	11	35.00±12.70	36.28	-.689	.521
12	point 12 r	11	35.18±11.77	33.45	-.304	-.527
13	point 21 l	28	42.18±17.73	29.25	.520	-.572
14	point 21 r	28	43.25±17.97	31.59	.511	-.265
15	point 22 l	34	43.32±18.28	42.03	.496	-.425
16	point 22 r	34	42.74±17.31	41.54	.381	-.748
17	point 23 l	40	42.40±18.69	42.19	.365	-.631
18	point 23 r	40	43.38±20.51	40.50	.433	-.812
19	point 25 l	36	48.75±22.23	44.08	.655	-.253
20	point 27 l	11	42.55±18.47	47.27	.795	-.532
21	point 27 r	11	41.27±17.77	45.60	.808	-.587
22	point 28 l	8	34.88±15.55	44.58	-.263	-.204
23	point 28 r	8	36.50±14.57	39.91	-.059	-.183
24	point 29 r	5	41.80±6.68	21.11	.165	.312

Table 2. Points with uniform distribution

№	Parameters	n	Mean ± Stand. dev.	Median	V (%)	Skew	Kurt.
1	point 4 r	4	30.50±11.09	31.50	36.36	-.111	-5.360
2	point 7 l	10	34.30±18.75	28.00	54.66	.858	-.611
3	point 7 r	10	34.20±19.32	29.00	56.49	.699	-.808
4	point 8 r	7	29.71±8.63	29.00	29.04	.236	-1.070
5	point 10 l	13	47.85±21.87	41.00	45.70	.210	-.596
6	point 10 r	13	44.92±17.09	40.00	38.04	.805	2.350
7	point 13 l	8	32.75±9.58	34.00	46.29	-1.084	2.642
8	point 13 r	8	32.25±10.19	34.50	38.38	-1.132	1.316
9	point 14 l	29	24.86±11.51	23.00	47.52	1.412	4.233
10	point 14 r	29	24.41±9.37	23.00	41.42	1.329	2.924
11	point 15 l	33	33.58±15.96	30.00	37.00	1.488	2.707
12	point 15 r	33	34.18±14.16	32.00	35.88	1.035	1.414
13	point 16 l	30	35.37±13.09	32.00	42.66	.882	.470
14	point 16 r	30	35.50±12.74	31.00	36.75	1.214	.844
15	point 17 l	29	37.03±15.80	34.00	40.97	.756	.464
16	point 17 r	29	37.00±13.60	34.00	35.38	.417	-1.069
17	point 18 l	22	36.68±15.03	33.50	45.09	1.581	1.940
18	point 18 r	22	36.68±12.98	36.68	36.48	1.398	2.173
19	point 19 l	24	36.83±16.61	36.83	44.96	1.165	.588
20	point 19 r	24	37.50±13.68	37.50	47.34	1.252	1.484
21	point 24 l	39	39.59±17.80	39.59	37.79	.609	-.134
22	point 24 r	39	39.69±18.79	39.69	43.40	1.047	1.572
23	point 25 r	11	62.82±23.74	50.17	43.05	1.51	3.54
24	point 29 r	5	41.20±8.70	29.00	15.98	-.308	-2.130

- The results of algometry are essential for timely diagnosis and prevention of back pain.
- The results of algometry are the basis for the development of individual physiotherapy.

Conclusion

Back pain was a significant complain affecting the teachers. In the preventive study of back pain in teachers algometry has shown its diagnostic effectiveness with respect to intensity and localization of pain.

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Conflict of interest statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

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