Answer to the letter to the editor of Hilla Sarig Bahat entitled “Do these large numbers contrast multiple smaller-number prior studies?”

Re: Kauther et al. 2012, Cervical range of motion and strength in 4,293 young male adults with chronic neck pain. European Spine Journal 21:1522–1527

Max Daniel Kauther

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We would like to thank the author for the close interest in our study and his thoughtful comments regarding our recent publication [1]. After reviewing our article, we partially agree with the critical remarks in the letter to the editor.

We focused on the young patient to the age of 32 and measured the neck pain history, CROM and cervical torque. Several studies on either CROM or cervical strength, including the proposed study of Cagnie et al. [2], were cited and discussed. We are sorry that we did not include the excellent three review articles on cervical neck pain that were suggested in the letter to the editor [3–5]. We know that our data are not in line with the existing opinion on this topic, but we take the view that this is an important reason why our data are worth publishing. Our study has obvious limitations regarding our “control group”, a point, which we discussed in the second paragraph of the discussion. To minimize possible criticism regarding our groups, we closer described both groups in Table 1 in the original publication. The pain history showed two large groups with highly significant differences of neck pain intensity, frequency, history and neck disability Index. Interestingly, these highly significant differences did not lead to the expected differences in the objectively measured CROM and cervical torque.

The author correctly noted that the “control group” should not be described by “healthy” or “normal” and that the title could be misleading. The cervical measurement system (CMS) goniometer was bought from the Frei

AG, Kirchzarten, Germany. The question concerning the “radiating” pain of the “neck pain group” cannot retrospectively be answered, as a further differentiation in radiculopathy, referred pain or radiating in the arm was not analyzed.

After consultation of a statistician, we are sorry to admit that we did not apply the right statistical tests on the correct data of means and standard deviations that were given in the text and in the Tables. The statistical analysis was redone: the normality of variables was evaluated with the Kolmogorov–Smirnov test showing a non-normal distribution of all parameters. Therefore, the differences of the “neck pain” and “control” group were analyzed using the Mann–Whitney *U* Test for non-normally distributed interval variables. The correlation between cervical spine biomechanics and pain intensity, pain frequency and pain history was obtained with the Spearman's rank-order correlation for non-normally distributed data. The following interpretation of the correlation coefficient was used: 0.00–0.19, “very weak/questionable correlation”; 0.20–0.39 “weak”; 0.40–0.59 “moderate”; 0.60–0.79 “strong”; 0.80–1.0 “very strong”. The statistical analysis showed significant differences of the patients' age, height, and weight and inpatient treatment in the last 3 months. A very weak negative correlation between the “neck pain intensity/neck pain frequency” and the range of motion for extension and left/right rotation was found. A very weak correlation of the “neck pain history” and left/right flexion was found. A very weak negative correlation of “neck pain intensity” and “neck pain frequency” and the extension torque and the left/right torque was found. The very weak correlation of cervical biomechanics and “pain intensity”, “pain frequency” and “history of neck pain” is shown in Table 1.

All in all, we are sorry for not using the right statistical tests beforehand. The unchanged means and standard

M. D. Kauther (✉)
Department of Trauma Surgery,
University of Duisburg-Essen, Hufelandstrasse 55,
45147 Essen, Germany
e-mail: maxdaniel.kauther@uk-essen.de

Table 1 Correlation of cervical biomechanics and “pain intensity”, “pain frequency” and “history of cervical pain”

	Correlation with “pain intensity”	Correlation with “pain frequency”	Correlation with “history of cervical pain”
Maximal flexion (°)	n.s.	n.s.	n.s.
Maximal extension (°)	−0.06*	−0.08*	n.s.
Maximal lateral flexion right (°)	n.s.	n.s.	0.11**
Maximal lateral flexion left (°)	n.s.	n.s.	0.11**
Maximal rotation right (°)	−0.06*	−0.08*	n.s.
Maximal rotation left (°)	−0.07*	n.s.	n.s.
Flexion torque (Nm/kg)	n.s.	n.s.	n.s.
Extension torque (Nm/kg)	−0.08*	−0.09*	n.s.
Lateral flexion right torque (Nm/kg)	n.s.	n.s.	n.s.
Lateral flexion left torque (Nm/kg)	n.s.	n.s.	n.s.
Rotation right torque (Nm/kg)	−0.09**	−0.08*	n.s.
Rotation left torque (Nm/kg)	−0.09**	−0.09**	n.s.

Significant correlation coefficients and the level of significance are shown (* $p < 0.05$, ** $p < 0.001$)
n.s. non significant

deviations described two clinically different groups with highly significant differences of the neck pain intensity, frequency, history and neck disability index, while statistically only a partly very weak correlation of cervical biomechanics and neck pain was found. We take the view that it is less comfortable but important to publish data that are not in line with the current literature. The question why to provide therapeutic exercise if there is no impairment cannot be answered with this study as we did not analyze the existing effect of therapeutic exercise on the neck pain, CROM and cervical strength. As we wrote in the discussion, we believe that the known positive effect of physiotherapy training for neck pain cannot solely be described by the easily measurable increasing maximal isometric strength. Further studies of functional MRI scans during different exercise forms could give an answer to the correlation of muscle function and neck pain [6]. We are in line with the opinion expressed in the letter to the editor that we have to critically appraise our work and aim for high research standards to provide a valid evidence base.

Conflict of interest None.

References

1. Kauther MD, Piotrowski M, Hussmann B, Lendemans S, Wedemeyer C (2012) Cervical range of motion and strength in 4,293 young male adults with chronic neck pain. *Eur Spine J* 21(8):1522–1527
2. Cagnie B, Cools A, De Loose V, Cambier D, Danneels L (2007) Differences in isometric neck muscle strength between healthy controls and women with chronic neck pain: the use of a reliable measurement. *Arch Phys Med Rehabil* 88:1441–1445
3. Dvir Z, Prushansky T (2008) Cervical muscles strength testing: methods and clinical implications. *J Manipulative Physiol Ther* 31(7):518–524
4. Nordin M, Carragee EJ, Hogg-Johnson S, Schechter Weiner S et al (2008) Assessment of neck pain and its associated disorders: results of the bone and joint decade 2000–2010 task force on neck pain and its associated disorders. *Spine* 33(4 Suppl):S101–S122
5. Childs JD, Cleland JA, Elliott JM, Teyhen DS, Wainner RS, Whitman JM, Sopky BJ, Godges JJ, Flynn TW (2008) Neck pain: clinical practice guidelines linked to the international classification of functioning, disability, and health from the orthopaedic section of the American physical therapy association. *J Orthop Sports Phys Ther* 38(9):A1–A34
6. O’Leary S, Cagnie B, reve A, Jull G, Elliott JM (2011) Is there altered activity of the extensor muscles in chronic mechanical neck pain? A functional magnetic resonance imaging study. *Arch Phys Med Rehabil* 92(6):929–934