

Accepted Manuscript

Twente spine model: A complete and coherent dataset for musculo-skeletal modeling of the thoracic and cervical regions of the human spine

Riza Bayoglu, Leo Geeraedts, Karlijn H.J. Groenen, Nico Verdonshot, Bart Koopman, Jasper Homminga

PII: S0021-9290(17)30200-2
DOI: <http://dx.doi.org/10.1016/j.jbiomech.2017.04.003>
Reference: BM 8184

To appear in: *Journal of Biomechanics*

Accepted Date: 9 April 2017



Please cite this article as: R. Bayoglu, L. Geeraedts, K.H.J. Groenen, N. Verdonshot, B. Koopman, J. Homminga, Twente spine model: A complete and coherent dataset for musculo-skeletal modeling of the thoracic and cervical regions of the human spine, *Journal of Biomechanics* (2017), doi: <http://dx.doi.org/10.1016/j.jbiomech.2017.04.003>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 Twente spine model: A complete and coherent dataset for
2 musculo-skeletal modeling of the thoracic and cervical regions of the
3 human spine

4 Riza Bayoglu^{a,*}, Leo Geeraedts^b, Karlijn H. J. Groenen^c, Nico Verdonshot^{a,c}, Bart
5 Koopman^a, Jasper Homminga^a

6 ^a*Department of Biomechanical Engineering, University of Twente, P.O. Box 217, 7500 AE Enschede, The
7 Netherlands*

8 ^b*Radboud University Medical Center, Department of Anatomy, Nijmegen, The Netherlands*

9 ^c*Radboud University Medical Center, Radboud Institute for Health Sciences, Orthopaedic Research Laboratory,
10 Nijmegen, The Netherlands*

11 **Abstract**

12 Musculo-skeletal modeling could play a key role in advancing our understanding of the
13 healthy and pathological spine, but the credibility of such models are strictly dependent on
14 the accuracy of the anatomical data incorporated. In this study, we present a complete and
15 coherent musculo-skeletal dataset for the thoracic and cervical regions of the human spine, ob-
16 tained through detailed dissection of an embalmed male cadaver. We divided the muscles into
17 a number of muscle-tendon elements, digitized their attachments at the bones, and measured
18 morphological muscle parameters. In total, 225 muscle elements were measured over 39 muscles.
19 For every muscle element, we provide the coordinates of its attachments, fiber length, tendon
20 length, sarcomere length, optimal fiber length, pennation angle, mass, and physiological cross-
21 sectional area together with the skeletal geometry of the cadaver. Results were consistent with
22 similar anatomical studies. Furthermore, we report new data for several muscles such as ro-
23 tatores, multifidus, levatores costarum, spinalis, semispinalis, subcostales, transversus thoracis,
24 and intercostales muscles. This dataset complements our previous study where we presented a
25 consistent dataset for the *lumbar* region of the spine (Bayoglu et al., 2017). Therefore, when
26 used together, these datasets enable a complete and coherent dataset for the entire spine. The
27 complete dataset will be used to develop a musculo-skeletal model for the entire human spine
28 to study clinical and ergonomic applications.

29
30 **Keywords:** Thoracic spine, Cervical spine, Cadaver, Musculo-skeletal model, Muscles, PCSA,
31 Sarcomere length, Optimum-fiber length

*Corresponding author at: Department of Biomechanical Engineering, University of Twente, P.O. Box 217,
7500 AE Enschede, The Netherlands.

Tel.: +31 053 4896477, Fax: +31 53 489 2287,

E-mail address: r.bayoglu@hotmail.com (R. Bayoglu).

Download English Version:

<https://daneshyari.com/en/article/5032020>

Download Persian Version:

<https://daneshyari.com/article/5032020>

[Daneshyari.com](https://daneshyari.com)