Hindawi
Computational and Mathematical Methods in Medicine
Volume 2017, Article ID 6752731, 2 pages
https://doi.org/10.1155/2017/6752731

Corrigendum

Corrigendum to "Comparative Sensitivity Analysis of Muscle Activation Dynamics"

Robert Rockenfeller,[1] Michael Günther,[2,3] Syn Schmitt,[2,4] and Thomas Götz[1]

[1] *Institut für Mathematik, Universität Koblenz, 56070 Koblenz, Germany*
[2] *Institut für Sport- und Bewegungswissenschaft, Universität Stuttgart, Allmandring 28, 70569 Stuttgart, Germany*
[3] *Institut für Sportwissenschaft, Lehrstuhl für Bewegungswissenschaft, Friedrich-Schiller-Universität, Seidelstraße 20, 07749 Jena, Germany*
[4] *Stuttgart Research Centre for Simulation Technology, Pfaffenwaldring 7a, 70569 Stuttgart, Germany*

Correspondence should be addressed to Michael Günther; s7gumi@uni-jena.de

Received 13 July 2017; Accepted 10 August 2017; Published 20 September 2017

We provide a comment to our paper "Comparative Sensitivity Analysis of Muscle Activation Dynamics," Computational and Mathematical Methods in Medicine (2015), 16 pages, Article ID 585409, DOI 10.1155/2015/585409 [1], where we stated an erroneous form of Hatze's activation dynamics that is not applicable to non-steady-state muscle processes. However, as we only considered steady-state situations, all results and consequences still hold true. The authors would like to apologize for any inconvenience caused.

In his consecutive work [2–4], Hatze introduced the dynamics of changes in activity q (activation dynamics) for skeletal muscle fibers in response to neural stimulation σ as a multilevel process, with γ being the relative free calcium ion concentration and ℓ_{CE} the length of the contractile element (CE). In [4, Eqns. 3.27, 3.29, and 3.30], this process is summarized as follows:

$$\begin{aligned} \dot{\gamma} &= m \cdot (\sigma - \gamma), \quad \gamma(0) = \gamma_0, \\ \rho(\ell_{\mathrm{CE}}) &= \rho_c \cdot \frac{\ell_\rho - 1}{\ell_\rho \cdot \ell_{\mathrm{CE,opt}}/\ell_{\mathrm{CE}} - 1}, \\ q(\ell_{\mathrm{CE}}, \gamma) &= \frac{q_0 + (\rho(\ell_{\mathrm{CE}}) \cdot \gamma)^\nu}{1 + (\rho(\ell_{\mathrm{CE}}) \cdot \gamma)^\nu}. \end{aligned} \tag{1}$$

In our main article [1, Eqn. (5)], we had reformulated the above equation system (1) as

$$\begin{aligned} \dot{q} = \frac{\nu \cdot m}{1 - q_0} \cdot \Big[&\sigma \cdot \rho(\ell_{\mathrm{CE}}) \cdot (1 - q)^{1+1/\nu} \cdot (q - q_0)^{1-1/\nu} \\ &- (1 - q) \cdot (q - q_0) \Big], \end{aligned} \tag{2}$$

in an effort to eliminate the state variable γ in favor of q. However, the specific formulation in (2) holds only true in the steady-state case $\dot{\ell}_{\mathrm{CE}} = 0$. This is because the transformation [5, Eqns. 3.21–3.24] was erroneously done by

$$\dot{q} = \frac{\partial q}{\partial \gamma} \dot{\gamma} \tag{3}$$

rather than properly taking the total derivative

$$\dot{q} = \frac{\partial q}{\partial \gamma} \dot{\gamma} + \frac{\partial q}{\partial \ell_{\mathrm{CE}}} \dot{\ell}_{\mathrm{CE}} \tag{4}$$

for the total time derivative of q.

In our framework only steady-state muscle conditions were investigated; that is, $\dot{\ell}_{\mathrm{CE}} = 0$, such that the second term of the right hand side in (4) vanishes. Hence, the situation from (2) holds throughout the article. In non-steady-state isometric contractions, this second term seems to be of reversed sign to the first, but with a considerably smaller absolute value; compare [6].

Acknowledgments

The authors would like to thank Maria Hammer for drawing attention to their computational error.

References

[1] R. Rockenfeller, M. Günther, S. Schmitt, and T. Götz, "Comparative sensitivity analysis of muscle activation dynamics," *Computational and Mathematical Methods in Medicine*, vol. 2015, Article ID 585409, 2015.

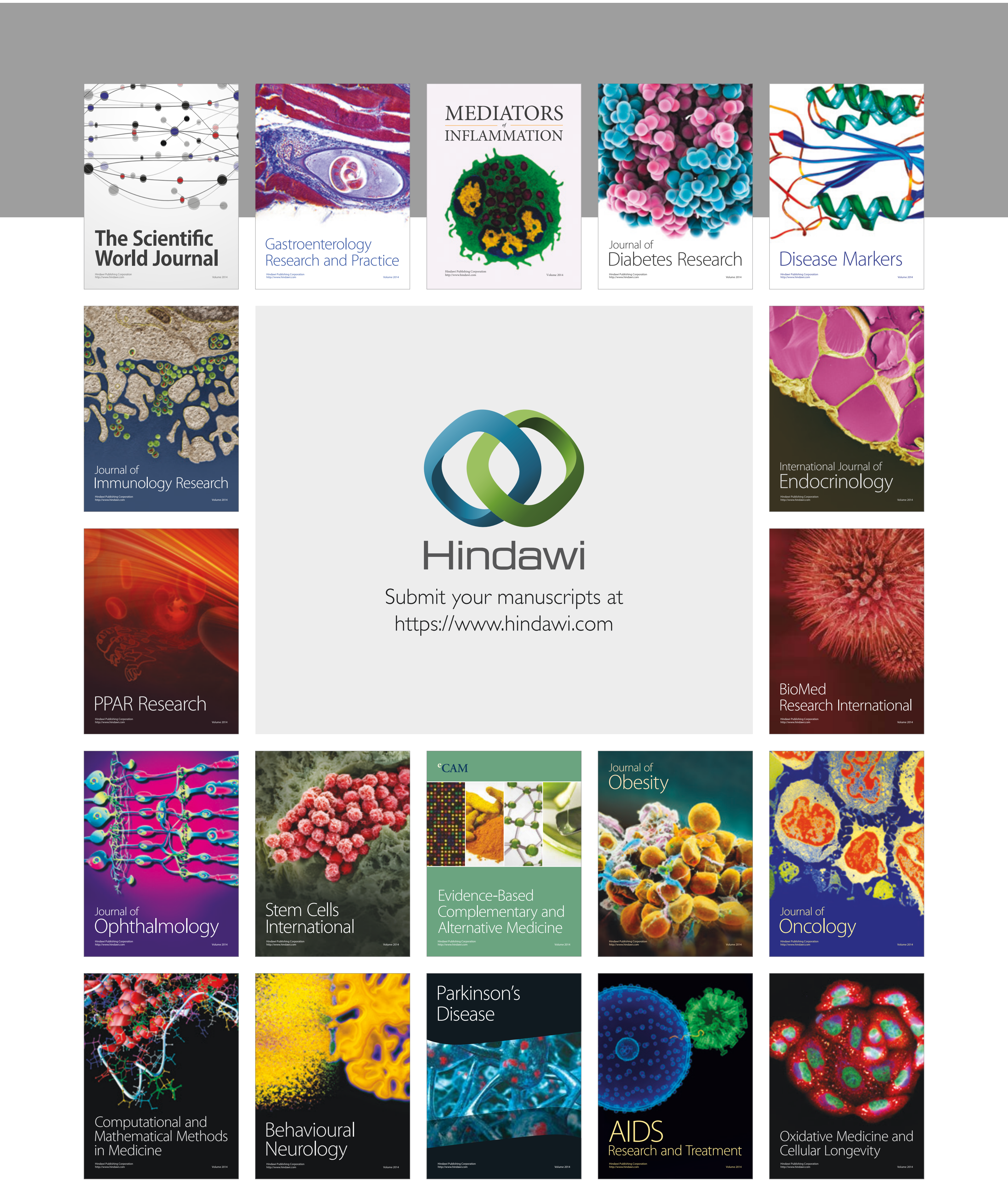
[2] H. Hatze, "A myocybernetic control model of skeletal muscle," *Biological Cybernetics*, vol. 25, no. 2, pp. 103–119, 1977.

[3] H. Hatze, "A general myocybernetic control model of skeletal muscle," *Biological Cybernetics*, vol. 28, no. 3, pp. 143–157, 1978.

[4] H. Hatze, *Myocybernetic control models of skeletal muscle*, University of South Africa, 1981.

[5] M. Günther, *Computersimulation zur Synthetisierung des muskulär erzeugten menschlichen Gehens unter Verwendung eines biomechanischen Mehrkörpermodells [Ph.D. thesis]*, Universität Tübingen, Tübingen, Germany, 1997.

[6] R. Rockenfeller and M. Günther, "Extracting low-velocity concentric and eccentric dynamic muscle properties from isometric contraction experiments," *Mathematical Biosciences*, vol. 278, pp. 77–93, 2016.


The Scientific World Journal
Gastroenterology Research and Practice
MEDIATORS of INFLAMMATION
Journal of Diabetes Research
Disease Markers
Journal of Immunology Research
International Journal of Endocrinology
Hindawi
Submit your manuscripts at
https://www.hindawi.com
PPAR Research
BioMed Research International
Journal of Ophthalmology
Stem Cells International
eCAM
Evidence-Based Complementary and Alternative Medicine
Journal of Obesity
Journal of Oncology
Computational and Mathematical Methods in Medicine
Behavioural Neurology
Parkinson's Disease
AIDS Research and Treatment
Oxidative Medicine and Cellular Longevity