Muscle Activity

1-ANALYSIS OF THE CORRELATION BETWEEN BRAIN AND MUSCLE REACTION IN REST AND LIMB MOVEMENTS

By Frischer, R (Frischer, Robert) [1] ; Krejcar, O (Krejcar, Ondrej) [2] , [3] , [4] ; Ghosh, DK (Ghosh, Dipak kumar) [5] ; Namazi, H (Namazi, Hamidreza) [1] , [6] (provided by Clarivate) **Source FRACTALS-COMPLEX GEOMETRY PATTERNS AND SCALING IN NATURE AND SOCIETY Volume 33 Issue 01 DOI 10.1142/S0218348X25500082 Article Number 2550008 Published 2025 Early Access JAN 2025 Indexed 2025-02-10 Document Type Article**

Abstract

The study of correlations between different organs under various conditions is a prominent field in biomedical science and engineering. This paper explores the relationship between brain and muscle activities during rest and various limb movements including plantar flexion and knee flexion. We employed complexity measures, calculating the fractal dimension (FD) and sample entropy (SampEn) of electroencephalogram (EEG) and electromyogram (EMG) signals, which serve as indicators of brain and muscle activities, respectively. Our analysis focused on how the complexity variations in these signals correlate across different tasks. The results revealed opposite trends in the complexity of EEG and EMG signals. Specifically, the complexity of EEG signals increased from initial rest to final rest, plantar flexion, and knee flexion, suggesting heightened neural activity likely due to motor planning and execution. Conversely, the complexity of EMG signals decreased, indicating more synchronized and consistent muscle contractions during these movements, reflecting coordinated motor control and reduced variability in muscular activity. This analytical approach can be applied to study the correlations between different organs' reactions and brain activity across various tasks.

Keywords
Author Keywords
BrainMuscleCorrelationComplexityFractal Dimension (FD)Sample Entropy (SampEn)

Keywords Plus
EMG SIGNALSFATIGUE

Muscle Activity

2-AI-Enabled Soft Sensing Array for Simultaneous Detection of Muscle Deformation and Mechanomyography for Metaverse Somatosensory Interaction

By Suo, J (Suo, Jiao) [1] ; Liu, YF (Liu, Yifan) [2] ; Wang, JF (Wang, Jianfei) [3] ; Chen, M (Chen, Meng) [1] ; Wang, K (Wang, Keer) [1] ; Yang, XM (Yang, Xiaomeng) [1] ; Yao, KM (Yao, Kuanming) [4] ; Roy, VAL (Roy, Vellaisamy A. L.) [5] ; Yu, XG (Yu, Xinge) [4] ; Daoud, WA (Daoud, Walid A.) [1] ; **(provided by Clarivate) Source ADVANCED SCIENCE Volume 11 Issue 16 DOI 10.1002/advs.202305025 Published APR 2024 Early Access FEB 2024 Indexed 2024-03-04 Document Type Article**

Abstract

Motion recognition (MR)-based somatosensory interaction technology, which interprets user movements as input instructions, presents a natural approach for promoting human-computer interaction, a critical element for advancing metaverse applications. Herein, this work introduces a non-intrusive muscle-sensing wearable device, that in conjunction with machine learning, enables motion-control-based somatosensory interaction with metaverse avatars. To facilitate MR, the proposed device simultaneously detects muscle mechanical activities, including dynamic muscle shape changes and vibrational mechanomyogram signals, utilizing a flexible 16-channel pressure sensor array (weighing approximate to 0.38 g). Leveraging the rich information from multiple channels, a recognition accuracy of approximate to 96.06% is achieved by classifying ten lower-limb motions executed by ten human subjects. In addition, this work demonstrates the practical application of muscle-sensing-based somatosensory interaction, using the proposed wearable device, for enabling the real-time control of avatars in a virtual space. This study provides an alternative approach to traditional rigid inertial measurement units and electromyography-based methods for achieving accurate human motion capture, which can further broaden the applications of motion-interactive wearable devices for the coming metaverse age.

A non-invasive wearable device has been developed, incorporating a soft pressure sensor array that enables simultaneous detection of muscle deformation and mechanomyography. By leveraging machine learning techniques, this device demonstrates its ability to recognize a minimum of ten distinct lower limb motions, showcasing significant potential for future metaverse applications. image

Keywords

Author Keywords

human motion recognitionmechanomyographynatural human-machine interactionnon-intrusive muscle activities sensingwearable devices

Keywords Plus

ACOUSTIC MYOGRAPHYMOTION CAPTURERECOGNITIONSYSTEMSENSORCONTRACTIONSPERCEPTIONTRANSFORMRESPONSESAMPLITUDE

Muscle Activity

3-Analysis and applications of respiratory surface EMG: report of a round table meeting

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By Jonkman, AH (Jonkman, A. H.) [1] ; Warnaar, RSP (Warnaar, R. S. P.) [2] ; Baccinelli, W (Baccinelli, W.) [3] ; Carbon, NM (Carbon, N. M.) [4] ; D'Cruz, RF (D'Cruz, R. F.) [5] ; Doorduin, J (Doorduin, J.) [6] ; van Doorn, JLM (van Doorn, J. L. M.) [6] ; Elshof, J (Elshof, J.) [7] ; Estrada-Petrocelli, L (Estrada-Petrocelli, L.) [8] , [9] ; Grasshoff, J (Grasshoff, J.) [10] ; **(provided by Clarivate) Source CRITICAL CARE Volume 28 Issue 1 DOI 10.1186/s13054-023-04779-x Article Number 2 Published JAN 2 2024 Indexed 2024-01-18 Document Type Review**

Abstract

Surface electromyography (sEMG) can be used to measure the electrical activity of the respiratory muscles. The possible applications of sEMG span from patients suffering from acute respiratory failure to patients receiving chronic home mechanical ventilation, to evaluate muscle function, titrate ventilatory support and guide treatment. However, sEMG is mainly used as a monitoring tool for research and its use in clinical practice is still limited-in part due to a lack of standardization and transparent reporting. During this round table meeting, recommendations on data acquisition, processing, interpretation, and potential clinical applications of respiratory sEMG were discussed. This paper informs the clinical researcher interested in respiratory muscle monitoring about the current state of the art on sEMG, knowledge gaps and potential future applications for patients with respiratory failure.

Keywords

Keywords Plus

PATIENT-VENTILATOR ASYNCHRONYMUSCLE-ACTIVITYNONINVASIVE VENTILATIONMECHANICAL VENTILATIONHUMAN DIAPHRAGMSEVERE EXACERBATIONSINSPIRATORY MUSCLESASTHMATIC-CHILDRENELECTROMYOGRAPHYDRIVE

Muscle Activity

4-Biocompatible and stable quasi-solid-state zinc-ion batteries for real-time responsive wireless wearable electronics

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By Zhang, BY (Zhang, Bingyao) [1] ; Cai, XZ (Cai, Xinze) [2] ; Li, JJ (Li, Jingjing) [3] , [4] ; Zhang, H (Zhang, Hao) [5] ; Li, DM (Li, Dongmin) [1] ; Ge, HY (Ge, Haoyang) [1] ; Liang, SQ (Liang, Shuquan) [1] ; Lu, BG (Lu, Bingan) [6] ; Zhao, JQ (Zhao, Jiangqi) [2] ; Zhou, J (Zhou, Jiang) [1] (provided by Clarivate) **Source ENERGY & ENVIRONMENTAL SCIENCE Volume 17 Issue 11 Page 3878-3887 DOI 10.1039/d4ee01212g Published JUN 4 2024 Early Access MAY 2024 Indexed 2024-05-23 Document Type Article**

Abstract

Wearable systems for continuous monitoring of muscle activity, data storage, and feedback treatment delivery represent innovative approaches to personalized healthcare. Monitoring the physiological responses of the body requires wearable systems with operational stability and satisfying biocompatibility to track real-time human motion parameters. However, progress of wearable electronics has been hampered by cumbersome power supply with inferior electrochemical stability, poisonous components and rigidity of commercial sensors. Herein, a highly integrated all-in-one strategy, i.e., a biocompatible, lightweight and flexible urea (Ur)-modified sodium alginate (SA) composite hydrogel (Ur-SA) designed as both a wearable strain sensor and the electrolyte of flexible zinc-ion batteries (ZIBs) is reported. Benefiting from the modulated Zn2+ solvation structure and the in situ generated electrolyte/electrode interphase in Ur-SA, the screen-printed planar ZIBs guarantee the operationally stable energy supply for a wearable sensing system. The flexibility and superior biocompatibility of Ur-SA validated through in vivo implantation endows itself with superior sensing properties. Especially, the modular wearable sensing system driven by screen-printed ZIBs has superior operational durability, ensuring a stable energy supply to the microcontroller unit (MCU) and biocompatible Ur-SA strain sensors, thereby continuously monitoring real-time physiological signals and human movements and then wirelessly transmitting them to mobile phones. These mark the realization of a safe, stable and biocompatible integrated wearable monitoring system. This design principle provides new insights into multivalent semi-solid electrochemistry, healthcare, implantable biomaterials and biomedical devices.
Based on the versatile Ur-SA hydrogel as an electrolyte and a strain sensor, an all-in-one wearable sensing system has been proposed for dynamic and comprehensive health monitoring.

Muscle Activity

5-DECODING THE CORRELATION BETWEEN BRAIN ACTIVITY AND FACIAL MUSCLE RESPONSE DURING EXTERNAL STIMULATION

By Krejcar, O (Krejcar, Ondrej) [1] , [2] , [3] ; Namazi, H (Namazi, Hamidreza) [1] , [4] (provided by clarivate) **Source FRACTALS-COMPLEX GEOMETRY PATTERNS AND SCALING IN NATURE AND SOCIETY Volume 33 Issue 01 DOI 10.1142/S0218348X25500136 Published 2025 Early Access FEB 2025 Indexed 2025-02-14 Document Type Article**

Abstract

The interplay between the brain and facial muscles involves a continuous exchange of information, where neural signals originating from the brain direct facial muscle reactions in response to various stimuli. In this research, we employed an information-based approach to study the brain-facial muscle relation in response to various conditions. To do so, we exposed 13 participants (3 F, 10 M, 19-22 years old) to three distinct types of music, each with varying levels of complexity. During these sessions, we recorded both Electroencephalogram (EEG) and Electromyogram (EMG) signals to capture neural and muscular responses, respectively. Subsequently, we utilized Shannon entropy to study the contained information in these signals. Our results demonstrated that music with higher complexity levels significantly altered the contained information in the signals. Furthermore, we identified a strong correlation in the alterations in the contained information among these signals. This suggests a significant connection among facial muscle and brain activities. This approach holds promise for investigating similar relationships among other physiological organs and brain activities, offering insights into broader patterns of physiological interactions.

Keywords

Author Keywords

Information-Based AnalysisBrain ActivityFacial Muscle ResponsesShannon EntropyMusic ComplexityPhysiological Interactions

Muscle Activity

6-Upconverting microgauges reveal intraluminal force dynamics in vivo

By Casar, JR (Casar, Jason R.) [1] ; Mclellan, CA (Mclellan, Claire A.) [1] ; Shi, CY (Shi, Cindy) [1] ; Stiber, A (Stiber, Ariel) [1] ; Lay, A (Lay, Alice) [2] ; Siefe, C (Siefe, Chris) [1] ; Parakh, A (Parakh, Abhinav) [1] , [3] ; Gaerlan, M (Gaerlan, Malaya) [1] , [4] ; Gu, XW (Gu, X. Wendy) [5] ; Goodman, MB (Goodman, Miriam B.) [6] ; **(provided by Clarivate) Source NATURE Volume 637 Issue 8044**
DOI 10.1038/s41586-024-08331-x Published JAN 2 2025 Indexed 2025-01-11 Document Type Article

Abstract

The forces generated by action potentials in muscle cells shuttle blood, food and waste products throughout the luminal structures of the body. Although non-invasive electrophysiological techniques exist1, 2-3, most mechanosensors cannot access luminal structures non-invasively4, 5-6. Here we introduce non-toxic ingestible mechanosensors to enable the quantitative study of luminal forces and apply them to study feeding in living Caenorhabditis elegans roundworms. These optical 'microgauges' comprise upconverting NaY0.8Yb0.18Er0.02F4@NaYF4 nanoparticles embedded in polystyrene microspheres. Combining optical microscopy and atomic force microscopy to study microgauges in vitro, we show that force evokes a linear and hysteresis-free change in the ratio of emitted red to green light. With fluorescence imaging and non-invasive electrophysiology, we show that adult C. elegans generate bite forces during feeding on the order of 10 mu N and that the temporal pattern of force generation is aligned with muscle activity in the feeding organ. Moreover, the bite force we measure corresponds to Hertzian contact stresses in the pressure range used to lyse the bacterial food of the worm7,8. Microgauges have the potential to enable quantitative studies that investigate how neuromuscular stresses are affected by ageing, genetic mutations and drug treatments in this organ and other luminal organs.

Keywords
Keywords Plus
HIGH-PRESSURE HOMOGENIZATIONUP-CONVERSIONNANOPARTICLESINACTIVATIONLUMINESCENCETOXICITYTENSIONENERGYMEDIA

Muscle Activity

7-Sex Differences in Association of Physical Activity With All-Cause and Cardiovascular Mortality

By Ji, HW (Ji, Hongwei) [1] , [7] ; Gulati, M (Gulati, Martha) [2] ; Huang, TY (Huang, Tzu Yu) [2] ; Kwan, AC (Kwan, Alan C.) [2] ; Ouyang, D (Ouyang, David) [2] ; Ebinger, JE (Ebinger, Joseph E.) [2] ; Casaletto, K (Casaletto, Kaitlin) [3] ; Moreau, KL (Moreau, Kerrie L.) [4] , [5] ; Skali, H (Skali, Hicham) [6] ; Cheng, SS (Cheng, Susan) [2] , [8] (provided by Clarivate) **Source JACC-JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY Volume 83 Issue 8 Page 783-793 DOI 10.1016/j.jacc.2023.12.019 Published FEB 27 2024 Early Access FEB 2024 Indexed 2024-04-17 Document Type Article**

Abstract

BACKGROUND Although physical activity is widely recommended for reducing cardiovascular and all-cause mortality risks, female individuals consistently lag behind male individuals in exercise engagement. OBJECTIVES The goal of this study was to evaluate whether physical activity derived health benefits may differ by sex. METHODS In a prospective study of 412,413 U.S. adults (55% female, age 44 +/- 17 years) who provided survey data on leisure-time physical activity, we examined sex-specific multivariable-adjusted associations of physical activity measures (frequency, duration, intensity, type) with all-cause and cardiovascular mortality from 1997 through 2019. RESULTS During 4,911,178 person-years of follow-up, there were 39,935 all-cause deaths including 11,670 cardiovascular deaths. Regular leisure-time physical activity compared with inactivity was associated with 24% (HR: 0.76; 95% CI: 0.73-0.80) and 15% (HR: 0.85; 95% CI: 0.82-0.89) lower risk of all-cause mortality in women and men, respectively (Wald F = 12.0, sex interaction P < 0.001). Men reached their maximal survival benefit of HR 0.81 from 300 min/wk of moderate-to-vigorous physical activity, whereas women achieved similar benefit at 140 min/wk and then continued to reach a maximum survival benefit of HR 0.76 also at w300 min/wk. Sex-specific findings were similar for cardiovascular death (Wald F = 20.1, sex interaction P < 0.001) and consistent across all measures of aerobic activity as well as muscle strengthening activity (Wald F = 6.7, sex interaction P = 0.009). CONCLUSIONS Women compared with men derived greater gains in all-cause and cardiovascular mortality risk reduction from equivalent doses of leisure-time physical activity. These findings could enhance efforts to close the "gender gap" by motivating especially women to engage in any regular leisure-time physical activity.

Keywords
Author Keywords
mortalityphysical activitysex differences

Keywords Plus
EXERCISE CAPACITYMUSCLE MASSMENSTRENGTHFITNESS

Muscle Activity

8-From mechanisms to future therapy: a synopsis of isolated REM sleep behavior disorder as early synuclein-related disease

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By Stefani, A (Stefani, Ambra) [1] ; Antelmi, E (Antelmi, Elena) [2] ; Arnaldi, D (Arnaldi, Dario) [3] , [4] ; Arnulf, I (Arnulf, Isabelle) [5] , [6] ; During, E (During, Emmanuel) [7] ; Högl, B (Hoegl, Birgit) [1] ; Hu, MMT (Hu, Michele M. T.) [8] ; Iranzo, A (Iranzo, Alex) [9] ; Luke, R (Luke, Russell) [10] ; Peever, J (Peever, John) [10] ; **(provided by Clarivate) Source MOLECULAR NEURODEGENERATION Volume 20 Issue 1 DOI 10.1186/s13024-025-00809-0 Article Number 19 Published FEB 11 2025 Indexed 2025-02-16 Document Type Review**

Abstract

Parkinson disease (PD), dementia with Lewy bodies (DLB) and multiple system atrophy are synucleinopathies, characterized by neuronal loss, gliosis and the abnormal deposition of alpha-synuclein in vulnerable areas of the nervous system. Neurodegeneration begins however several years before clinical onset of motor, cognitive or autonomic symptoms. The isolated form of REM sleep behavior disorder (RBD), a parasomnia with dream enactment behaviors and excessive muscle activity during REM sleep, is an early stage synucleinopathy. The neurophysiological hallmark of RBD is REM sleep without atonia (RWSA), i.e. the loss of physiological muscle atonia during REM sleep. RBD pathophysiology is not fully clarified yet, but clinical and basic science suggest that alpha-syn pathology begins in the lower brainstem where REM atonia circuits are located, including the sublaterodorsal tegmental/subcoeruleus nucleus and the ventral medulla, then propagates rostrally to brain regions such as the substantia nigra, limbic system, cortex. Genetically, there is only a partial overlap between RBD, PD and DLB, and individuals with iRBD may represent a specific subpopulation. A genome-wide association study identified five loci, which all seem to revolve around the GBA1 pathway. iRBD patients often show subtle motor, cognitive, autonomic and/or sensory signs, neuroimaging alterations as well as biofluid and tissue markers of neurodegeneration (in particular pathologic alpha-synuclein aggregates), which can be useful for risk stratification. Patients with iRBD represent thus the ideal population for neuroprotective/neuromodulating trials. This review provides insights into these aspects, highlighting and substantiating the central role of iRBD in treatment development strategies for synucleinopathies.

Keywords

Keywords Plus

EYE-MOVEMENT SLEEPALPHA-SYNUCLEINPARKINSONS-DISEASEPARADOXICAL SLEEPCOERULEUS/SUBCOERULEUS COMPLEXSPATIOTEMPORAL CHANGESRETICULAR-FORMATIONINITIATIVE COHORTGAUCHER-DISEASELOCUS-COERULEUS

Muscle Activity

9-Awake bruxism behaviors frequency in a group of healthy young adults with different psychological scores

By Saracutu, OI (Saracutu, Ovidiu Ionut) [1] ; Manfredini, D (Manfredini, Daniele) [1] ; Bracci, A (Bracci, Alessandro) [2] ; Cagidiaco, EF (Cagidiaco, Edoardo Ferrari) [1] ; Ferrari, M (Ferrari, Marco) [1] ; Colonna, A (Colonna, Anna) [1] **(provided by Clarivate) Source CRANIO-THE JOURNAL OF CRANIOMANDIBULAR & SLEEP PRACTICE Volume 43 Issue 5 Page 827-834 DOI 10.1080/08869634.2024.2357199 Published SEP 3 2025 Early Access JUN 2024 Indexed 2024-06-13 Document Type Article**

Abstract

ObjectiveTo assess the frequency of awake bruxism (AB) behaviors in a group of undergraduate dentistry students and correlate it with the status of anxiety and depression.Materials and MethodsThe frequency of five oral behaviors (i.e., relaxed jaw muscle, teeth contact, mandible bracing, teeth clenching, teeth grinding) was evaluated using a smartphone-based ecological momentary assessment (EMA) approach. The anxiety and depression status was investigated with the four-item patient health questionnaire for anxiety and depression (PHQ-4). ANOVA with Tukey post-hoc test was used to assess the difference in frequency of AB behaviors among the four PHQ-4 groups.ResultsAmong the four groups, there was a statistically significant difference in the frequency of relaxed jaw muscle, teeth contact, mandible bracing, and teeth clenching, but not for teeth grinding.ConclusionBased on this cross-sectional study's findings, psyche seems to have a determinant impact on AB behaviors, which is significantly higher in individuals with anxiety and depression traits.

Keywords
Author Keywords
Awake bruxismbruxism behaviorsecological momentary assessmentanxietydepression

Keywords Plus
MASTICATORY MUSCLE-ACTIVITYPSYCHOSOCIAL FACTORSMENTAL-HEALTHANXIETYDEPRESSIONRELIABILITYPERFORMANCESTUDENTSFEATURESSTRESS

Muscle Activity

10-The Physical Activity Paradox in Low Muscle Mass in Middle-Aged and Older Adults

By Kim, B (Kim, Bokun) [1] , [2] ; Osuka, Y (Osuka, Yosuke) [3] ; Okubo, Y (Okubo, Yoshiro) [4] ; Zhao, XG (Zhao, Xiaoguang) [5] ; Kim, GM (Kim, Gwon-min) [2] , [6] ; Oh, S (Oh, Sechang) [2] , [7]
(provided by Clarivate) Source AMERICAN JOURNAL OF PREVENTIVE MEDICINE Volume 68 Issue 2 Page 348-356 DOI 10.1016/j.amepre.2024.10.015 Published FEB 2025 Early Access JAN 2025 Indexed 2025-02-05 Document Type Article

Abstract

Introduction: Physical activity is widely accepted as a therapeutic approach to age-related muscle mass loss. However, it is unclear whether all physical activity domains benefit muscle mass maintenance. This study investigated the association between low muscle mass and domain-specific physical activity, including leisure-time and occupational moderate-to-vigorous physical activity (MVPA). Methods: This study included 27,357 middle-aged and older individuals (>= 40 years) whose data were collected from 2014 to 2022 and analyzed in 2024. Low muscle mass was defined as a muscle mass index 2 SDs below the sex-specific average of 9,426 young individuals (aged 20-39 years). Leisure-time and occupational MVPA were assessed using the Global Physical Activity Questionnaire and categorized as 0 min/wk, 1-149 min/wk, and >= 150 min/wk. Logistic regression analysis focused on all participants, and additional analyses stratified by sex, age, sedentary time, and transfer time were performed. Results: For leisure-time MVPA, participants with 1-149 min/wk and >= 150 min/wk had significantly lower odds of low muscle mass compared to those with no MVPA, with ORs of 0.795 (95% CI=0.691, 0.914) and 0.740 (95% CI=0.649, 0.843), respectively ($p<0.01$ for both). No significant association was found between occupational MVPA and low muscle mass. These findings were consistent across different strata of sex, age, sedentary time, and transfer time. Conclusions: Leisure-time MVPA is inversely associated with low muscle mass, whereas occupational MVPA shows no association, highlighting the importance of dynamic movements of sufficient intensity and recuperation time in maintaining muscle mass.

Keywords
Keywords Plus
INSULIN-RESISTANCEBODY-COMPOSITIONCAUSE MORTALITYHEALTHSARCOPENIA

Muscle Activity

11-TCNN-KAN: Optimized CNN by Kolmogorov-Arnold Network and Pruning Techniques for sEMG Gesture Recognition

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By Al-qaness, MAA (Al-qaness, Mohammed A. A.) [1] , [2] ; Ni, SK (Ni, Sike) [1] (provided by Clarivate)
Source IEEE JOURNAL OF BIOMEDICAL AND HEALTH INFORMATICS Volume 29 Issue 1
Page 188-197 DOI 10.1109/JBHI.2024.3467065 Published JAN 2025 Indexed 2025-01-19
Document Type Article

Abstract

Surface electromyography (sEMG) is a non-invasive technique that records the electrical signals generated by muscle activity. sEMG signals are widely used in the field of biomedical and health informatics for diagnosing and monitoring neuromuscular disorders, as well as in fields such as motor control, rehabilitation, and human-computer interaction. In this paper, we propose a novel model called the Triple Convolutional Neural Network and Kolmogorov-Arnold Network (TCNN-KAN) for recognizing gesture signals based on sEMG. Our approach replaces the commonly used fully connected layer with the KAN, parameterizing it as a spline function to improve classification accuracy. Specifically, when using a KAN instead, generate the TCNN-KAN-1 model. When using two KAN layers, generate the TCNN-KAN-2 model and generate the TCNN-KAN-3 model when KAN replaces all fully connected layers. Firstly, to ensure the model learns universal features, we fuse gesture signals from different individuals and segment them to create uniform window sizes. Then, the processed signal is input into the basic convolution layer of different depths for training. In order to improve the accuracy, we convert the standard fully connected layer in the convolutional layer to the KAN layer so that it has a learnable activation function in weight. Finally, we introduce unstructured pruning to reduce computational complexity and minimize overfitting by removing channels with lower feature importance. We use three datasets, NinaPro DB1, NinaPro DB5, and CSL, for evaluation. The results show that on the TCNN-KAN-2 model, each dataset has achieved the highest accuracy. Specifically, when the pruning rates were 0.2, 0.1, and 0.4, the accuracy rates reached 98.38%, 93.81%, and 75.56%, respectively.

Keywords
Author Keywords
Feature extractionAccuracyConvolutional neural networksElectromyographySupport vector machinesMusclesGesture recognitionHealth informaticsbiomedicalhumancomputer interactiongesture recognitiondeep learningkolmogorov-arnold networkpruning techniquessurface electromyography(sEMG)

Keywords Plus
ARMBAND

Muscle Activity

12-Effects of dietary *Spirulina platensis* supplementation on growth performance, whole body composition, antioxidant activity, histological alterations, and resistance to *Vibrio parahaemolyticus* in Pacific white shrimp, *Litopenaeus vannamei*

By Ahmed, RA (Ahmed, Ragaa A.) [1] ; Jastaniah, SD (Jastaniah, Samyah D.) [2] ; Alaidaroos, BA (Alaidaroos, Bothaina A.) [2] ; Shafi, ME (Shafi, Manal E.) [3] ; El-Haroun, E (El-Haroun, Ehab) [4] ; Abd El-Aziz, YM (Abd El-Aziz, Yasmin M.) [5] ; Abd El Megeed, OH (Abd El Megeed, Ola Hasan) [6] ; AL-Qurashi, MM (AL-Qurashi, Mada M.) [7] ; Bahshwan, SMA (Bahshwan, Safia M. A.) [7] ; Munir, MB (Munir, Mohammad Bodrul) [8] ; **(provided by Clarivate) Source AQUACULTURE REPORTS Volume 40 DOI 10.1016/j.aqrep.2024.102606 Article Number 102606 Published MAR 15 2025 Early Access JAN 2025 Indexed 2025-01-25 Document Type Article**

Abstract

Spirulina platensis has been extensively studied from its economic significance. It is also used as a feed additive in aquafeeds, where it serves as a growth promoter and immune stimulant. The genus S. platensis recognize for its high protein content, carotenoid, phycocyanin and phytochemicals content, which can help mitigate challenges in the aquaculture industry challenges such as disease outbreaks, pathogen infection and ultimately contributing to aquaculture sustainability. In this context, an eight-week feeding experiment was conducted to investigate the potential effects of dietary S. platensis (SP) on feed utilization, growth performance, antioxidant activity, and muscle and hepatopancreatic histology of Litopenaeus vannamei challenged with Vibrio parahaemolyticus. A total of 300 shrimps were included in this experiment. Shrimp were fed diets enriched with 2 g/kg (T1), 4 g/kg (T2), 6 g/kg (T3), and 8 g/kg (T4) of SP with the control group (T0) being fed a basal diet. The results showed that shrimp fed diets supplemented with 4, 6, or 8 g/kg SP exhibited significant improvements in the final body weight, weight gain, specific growth rate, feed conversion ratio, and survival rate ($P <= 0.05$). Shrimp in the T3 and T4 groups exhibited significantly lower malondialdehyde activity ($P <= 0.05$) compared to the other groups. All SP-supplemented groups resulted in higher levels of GPx, SOD, and CAT compared to the T0 group ($P < 0.05$). Feeding shrimp diets supplemented with 8 g of SP resulted in the highest crude protein and ash content, with significantly lower crude lipid levels in the whole body of shrimp ($P < 0.05$). Shrimp fed 8 g/kg of SP showed the highest survival rate ($P <= 0.05$) against V. parahaemolyticus. Including SP in shrimp diets, especially at 6 and 8 g/kg levels, improved the histological profile of muscle and hepatopancreatic tissues. Overall, the present study highlights the potential impact of S. platensis in shrimp diet by showing significant improvements in growth, antioxidant capacity, histological changes and resistance to against V. parahaemolyticus Thus, S. platensis can be recommended as a beneficial feed supplement for the shrimp industry.

Keywords
Author Keywords
Litopenaeus vannameiSpirulina platensisVibrio parahaemolyticusAntioxidantsHistopathogy
Keywords Plus

Muscle Activity

LITOPENAEUS-VANNAMEINILE TILAPIAFISH-MEALSUBSTITUTIONPARAMETERSPROBIOTICSPREBIOTICSRATES

13-The Vicious Cycle of Type 2 Diabetes Mellitus and Skeletal Muscle Atrophy: Clinical, Biochemical, and Nutritional Bases

By Lopez-Pedrosa, JM (Lopez-Pedrosa, Jose M.) [1] ; Camprubi-Robles, M (Camprubi-Robles, Maria) [1] ; Guzman-Rolo, G (Guzman-Rolo, German) [2] ; Lopez-Gonzalez, A (Lopez-Gonzalez, Andres) [1] ; Garcia-Almeida, JM (Garcia-Almeida, Jose Manuel) [3] ; Sanz-Paris, A (Sanz-Paris, Alejandro) [4] ; Rueda, R (Rueda, Ricardo) [1] (provided by Clarivate) **Source NUTRIENTS Volume 16 Issue 1 DOI 10.3390/nu16010172 Article Number 172 Published JAN 2024 Indexed 2024-01-18 Document Type Review**

Abstract

Today, type 2 diabetes mellitus (T2DM) and skeletal muscle atrophy (SMA) have become increasingly common occurrences. Whether the onset of T2DM increases the risk of SMA or vice versa has long been under investigation. Both conditions are associated with negative changes in skeletal muscle health, which can, in turn, lead to impaired physical function, a lowered quality of life, and an increased risk of mortality. Poor nutrition can exacerbate both T2DM and SMA. T2DM and SMA are linked by a vicious cycle of events that reinforce and worsen each other. Muscle insulin resistance appears to be the pathophysiological link between T2DM and SMA. To explore this association, our review (i) compiles evidence on the clinical association between T2DM and SMA, (ii) reviews mechanisms underlying biochemical changes in the muscles of people with or at risk of T2DM and SMA, and (iii) examines how nutritional therapy and increased physical activity as muscle-targeted treatments benefit this population. Based on the evidence, we conclude that effective treatment of patients with T2DM-SMA depends on the restoration and maintenance of muscle mass. We thus propose that regular intake of key functional nutrients, along with guidance for physical activity, can help maintain euglycemia and improve muscle status in all patients with T2DM and SMA.

Keywords
Author Keywords
diabetes mellitusmalnutritionmuscle massmuscle strengthobesitysarcopeniaskeletal muscle atrophy

Keywords Plus
MONOUNSATURATED FATTY-ACIDSVITAMIN-D SUPPLEMENTATIONSARCOPENIC OBESITYOXIDATIVE STRESSGLYCEMIC CONTROLHEART-FAILURECARDIOVASCULAR-DISEASEFUNCTIONAL-CAPACITYINSULIN-RESISTANCEPHYSICAL-ACTIVITY

Muscle Activity

14-Cellular Feimin enhances exercise performance by suppressing muscle thermogenesis

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Abstract

Exercise can rapidly increase core body temperature, and research has indicated that elevated internal body temperature can independently contribute to fatigue during physical activity. However, the precise mechanisms responsible for regulating thermogenesis in muscles during exercise have remained unclear. Here, we demonstrate that cellular Feimin (cFeimin) enhances exercise performance by inhibiting muscle thermogenesis during physical activity. Mechanistically, we found that AMP-activated protein kinase (AMPK) phosphorylates cFeimin and facilitates its translocation into the cell nucleus during exercise. Within the nucleus, cFeimin binds to the forkhead transcription factor FOXC2, leading to the suppressed expression of sarcolipin (Sln), which is a key regulator of muscle thermogenesis. In addition, our results further reveal that short-term AMPK agonist treatments can enhance exercise performance through the activation of the AMPK-cFeimin signalling pathway. In summary, these results underscore the crucial role of cFeimin in enhancing exercise performance by modulating SLN-mediated thermogenesis.

Keywords

Keywords Plus

ACTIVATED PROTEIN-KINASESKELETAL-MUSCLEMALIGNANT HYPERTHERMIAGLUCOSE-UPTAKESARCOLIPIN OVEREXPRESSIONMETABOLIC-RESPONSEAMPKFOXC2RYR1GENE

Muscle Activity

15-Experiment-free exoskeleton assistance via learning in simulation

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Abstract

Exoskeletons have enormous potential to improve human locomotive performance1-3. However, their development and broad dissemination are limited by the requirement for lengthy human tests and handcrafted control laws2. Here we show an experiment-free method to learn a versatile control policy in simulation. Our learning-in-simulation framework leverages dynamics-aware musculoskeletal and exoskeleton models and data-driven reinforcement learning to bridge the gap between simulation and reality without human experiments. The learned controller is deployed on a custom hip exoskeleton that automatically generates assistance across different activities with reduced metabolic rates by 24.3%, 13.1% and 15.4% for walking, running and stair climbing, respectively. Our framework may offer a generalizable and scalable strategy for the rapid development and widespread adoption of a variety of assistive robots for both able-bodied and mobility-impaired individuals.

A learning-in-simulation framework for wearable robots uses dynamics-aware musculoskeletal and exoskeleton models and data-driven reinforcement learning to bridge the gap between simulation and reality without human experiments to assist versatile activities.

Keywords

Keywords Plus

METABOLIC COSTMUSCLE-ACTIVITYWALKINGMECHANICSINCLINEDESIGNROBOT

Muscle Activity

16-Mechanism and physical activities in bone-skeletal muscle crosstalk

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Abstract

Bone and skeletal muscle work in coordination to maintain the function of the musculoskeletal system, in which skeletal muscle contraction drives the movement of the bone lever system while bone provides insert sites for skeletal muscle through the bone-muscle junction. Existing evidence suggests that factors secreted by skeletal muscle and bone mediate the interaction between the two tissues. Herein, we focused on the relationship between skeletal muscle and bone and the underlying mechanism of the interaction. Exercise can promote bone strength and secrete osteocalcin and insulin-like growth factor I into the blood, thus improving muscle quality. In addition, exercise can also promote myostatin, interleukin-6, Irisin, and apelin in muscles to enter the blood so that they can act on bones to maintain the balance between bone absorption and bone formation. There is a special regulatory axis interleukin-6/osteocalcin between myokines and osteokines, which is mainly influenced by exercise. Therefore, we pay attention to the important factors in the bone-muscle intersection that are affected by exercise, which were found or their functions were expanded, which strengthened the connection between organs of the whole body, highlighting the importance of exercise and contributing to the diagnosis, prevention, and treatment of osteoporosis and sarcopenia in the clinic.

Keywords
Author Keywords
bone-skeletal muscle crosstalkmyostatinirisinIL-6OCNIGF-1sclerostinphysical activities

Keywords Plus
GROWTH-FACTOR IPROMOTES OSTEOGENESISSTEM-CELLSMYOSTATINDIFFERENTIATIONOSTEOCALCININTERLEUKIN-6EXERCISEMYOKINEMASS

Muscle Activity

17-Myosteatosis: Diagnosis, pathophysiology and consequences in metabolic dysfunction-associated steatotic liver disease

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By Henin, G (Henin, Guillaume) [1] , [2] ; Loumaye, A (Loumaye, Audrey) [3] ; Leclercq, IA (Leclercq, Isabelle A.) [2] ; Lanthier, N (Lanthier, Nicolas) [1] , [2] (provided by Clarivate) **Source JHEP REPORTS Volume 6 Issue 2 DOI 10.1016/j.jhepr.2023.100963 Article Number 100963 Published FEB 2024 Indexed 2024-03-04 Document Type Review**

Abstract

Metabolic dysfunction-associated steatotic liver disease (MASLD) is associated with an increased risk of multisystemic complications, including muscle changes such as sarcopenia and myosteatosis that can reciprocally affect liver function. We conducted a systematic review to highlight innovative assessment tools, pathophysiological mechanisms and metabolic consequences related to myosteatosis in MASLD, based on original articles screened from PUBMED, EMBASE and COCHRANE databases. Forty-six original manuscripts (14 pre-clinical and 32 clinical studies) were included. Microscopy (8/14) and tissue lipid extraction (8/14) are the two main assessment techniques used to measure muscle lipid content in pre-clinical studies. In clinical studies, imaging is the most used assessment tool and included CT (14/32), MRI (12/32) and ultrasound (4/32). Assessed muscles varied across studies but mainly included paravertebral (4/14 in pre-clinical; 13/32 in clinical studies) and lower limb muscles (10/14 in preclinical; 13/32 in clinical studies). Myosteatosis is already highly prevalent in non-cirrhotic stages of MASLD and correlates with disease activity when using muscle density assessed by CT. Numerous pathophysiological mechanisms were found and included: high-fat and high-fructose diet, dysregulation in fatty acid transport and ketogenesis, endocrine disorders and impaired microRNA122 pathway signalling. In this review we also uncover several potential consequences of myosteatosis in MASLD, such as insulin resistance, MASLD progression from steatosis to metabolic steatohepatitis and loss of muscle strength. In conclusion, data on myosteatosis in MASLD are already available. Screening for myosteatosis could be highly relevant in the context of MASLD, considering its correlation with MASLD activity as well as its related consequences.

Keywords

Keywords Plus

NONALCOHOLIC FATTY LIVERINTRAMYOCELLULAR LIPID-CONTENTSKELETAL-MUSCLEINSULIN-RESISTANCEADIPOSE-TISSUEMITOCHONDRIAL-FUNCTIONINTRAHEPATIC TRIGLYCERIDEHEPATIC STEATOSISSELENOPROTEIN-PIN-VIVO