Μυοσκελετική γήρανση

Ε. Μητσιοκάπα MD, PhD, FBPMR

Ιατρός Φυσικής Ιατρικής και Αποκατάστασης

Bouncing Back! Counteracting Muscle Aging With Plyometric Muscle Loading

Martino V. Franchi[1,2*], *Elena Monti*[3], *Austin Carter*[4], *Jonathan I. Quinlan*[5], *Philip J. J. Herrod*[4], *Neil D. Reeves*[6] *and Marco V. Narici*[3]

frontiers in Physiology

ORIGINAL RESEARCH
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- Hypothesis
  - plyometric training, based on exercise against one own's body mass, would be effective for increasing muscle mass and power in older individuals

MATERIALS AND METHODS

- 14 young participants
  - age = 25.4 ± 3.5 years (20-32 years range)
- 9 older volunteers
  - age = 69.7 ± 3.4/years (65-76 years old range)
- 6-week plyometric training program.

- Participants characteristics
  - Healthy
  - Fully independent and recreationally active
  - Not practicing regular vigorous physical activity and had not been engaged in any plyometric or strength training programs within the past 6 months

Trampoline-Trainer Exercise

- "Tramp-Trainer" (TT) exercise machine
  - (FREI AG, Hinterzarten, Germany, EU)

Training Protocol

- Training
  - 3 times per week X 6 consecutive weeks
- The young group
  - 4 sets x 30 repetitions X 4 weeks
  - 5 sets ª 30 repetitions X 2 weeks
- The elderly group
  - 3 sets ª 30 repetitions X 4 weeks
  - 4 sets ª 30 repetitions X 2 weeks

- *Training volume was based upon the guidelines of (Chu, 1998), stating that beginner and intermediate status athletes should not exceed 120 foot contacts per session when implementing a new plyometric training program*

- Isometric Maximum Voluntary Contraction Torque
  - Isokinetic dynamometer (Cybex Norm, Cybex International Inc., NY, USA)
- Muscle Power Test
  - Leg extension power was assessed using the Nottingham Power Rig
- Total External Mechanical Work
- Muscle Morphology and Architecture
  - Of the vastus lateralis muscle was measured in vivo using B-mode ultrasonography (Mylab70, Esaote, Genoa, Italy) (Figure 2).
- EMG Evaluation
  - During a Single Counter-Movement Jump (CMJ) Task (vastus lateralis)
- Rate of Perceived Exertion (RPE) and Muscle Soreness
  - Borg Scale
- Blood Pressure and Heart Rate
  - before and after each set
- Statistical Analysis

RESULTS

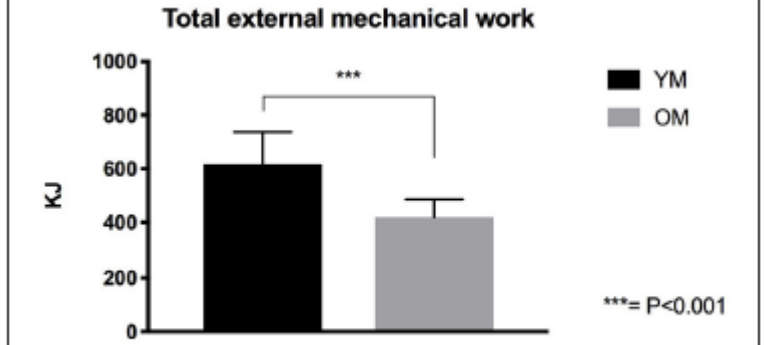

FIGURE 3 | Total External mechanical work performed by YM and OM groups.

TABLE 1 | Pre-to-post values for muscle functional and morphological features.

	Young males		Older males	
	Baseline	**6 Weeks**	**Baseline**	**6 Weeks**
MVC (Nm)	246.15 ± 50.69	260.35 ± 50.16	204.75 ± 43.98	221.03 ± 42.87
Power (W)	423.83 ± 136.33	506.08 ± 153.23***	327.26 ± 82.08	408.21 ± 107.97***
CMJ EMG (mV)	0.23 ± 0.10	0.30 ± 0.13**	0.15 ± 0.06	0.21 ± 0.07*
VL MT (cm)	2.44 ± 0.34	2.54 ± 0.35**	1.96 ± 0.32^	2.09 ± 0.33**,^
VL PA (deg)	16.35 ± 1.36	17.03 ± 1.63***	14.48 ± 2.32^	15.51 ± 2.08***
VL Lf (cm)	7.66 ± 0.90	8.12 ± 0.91***	7.51 ± 0.41	8.15 ± 0.39***
RPE	5.18 ± 1.53	3.33 ± 1.81**	4.45 ± 1.91	3.65 ± 1.62
Soreness scale	3.33 ± 1.84	1.49 ± 1.82**	1.85 ± 2.01	1.21 ± 1.73

*Baseline vs. 6 Weeks differences: *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.*
Between groups differences (at the same time-point): ^$P < 0.05$, ^^$P < 0.01$.

CONCLUSION

- Plyometric exercise is an effective tool in counteracting sarcopenia in human muscle in a training period of only 6 weeks.
  - both young and older individual achieved similar increases in muscle size and power through plyometric exercise.
  - significant implications for reducing risks of hip fractures, improving ability to perform daily tasks, and improving functional independence and quality of life in the elderly.

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Muscoloskeletal aging, sarcopenia and cancer

Colloca Giuseppe [a,*], Di Capua Beatrice [b], Bellieni Andrea [b], Cesari Matteocenzo [c], Valentini Vincenzo [a], Marzetti Emanuele [b], Calvani Riccardo [b]

[a] Dipartimento di Diagnostica per Immagini, Radioterapia Oncologica ed Ematologia, Istituto di Radiologia, Fondazione Policlinico A. Gemelli IRCCS - Università Cattolica Sacro Cuore, Largo A. Gemelli, 8, 00168, Rome, Italy
[b] Università Cattolica del Sacro Cuore, Rome 00168, Italy
[c] Unit of Epidemiology, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy

- Aim
- To know the differences between
  - Normal process of muscle aging
  - Sarcopenia
  - Cachexia
    - Similar clinical features to sarcopenia
    - Deeply different in terms of pathophysiological and etiological characteristics

Table 2
Comparison between Sarcopenia and Cachexia.

	Sarcopenia	Cachexia
Weight	=	↓↓
Lean tissue	↓	↓↓
Fat tissue	= or ↑	↓
Appetite	=	↓
Cortisol	=	↑
Inflammatory disease	No	Yes
Pathway	Does not lead to cachexia	May lead to sarcopenia

Conclusion

- Sarcopenia and muscle wasting related to physical inactivity are considered treatable and reversible conditions.
- Cachexia is a complex metabolic syndrome associated with an underlying illness that cannot be fully reversed by the conventional nutritional support

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REVIEW ARTICLE

EPIDEMIOLOGY, CLINICAL PRACTICE AND HEALTH

Sarcopenia and dysphagia: Position paper by four professional organizations

Ichiro Fujishima,[1] Masako Fujiu-Kurachi,[2] Hidenori Arai,[3] Masamitsu Hyodo,[4] Hitoshi Kagaya,[5] Keisuke Maeda,[6] Takashi Mori,[7] Shinta Nishioka,[8] Fumiko Oshima,[9] Sumito Ogawa,[10] Koichiro Ueda,[11] Toshiro Umezaki,[12] Hidetaka Wakabayashi,[13] Masanaga Yamawaki[14] and Yoshihiro Yoshimura[15]

Japanese Society of Dysphagia Rehabilitation
Japanese Association of Rehabilitation Nutrition
Japanese Association on Sarcopenia and Frailty
Society of Swallowing and Dysphagia of Japan

- Aim
  - To merge the currently available evidence on the topics of sarcopenia and dysphagia

History of sarcopenia

- 1989
  - The concept of sarcopenia was introduced as an age-dependent decline in muscle mass
- 2010
  - European Working Group on Sarcopenia in Older People published the clinical definition and diagnostic procedures of sarcopenia
    - “Sarcopenia is a syndrome characterized by a progressive and generalized loss of skeletal muscle mass and strength, with a risk of adverse outcomes, such as physical disability, poor quality of life and death.”
- 2014
  - Asian Working Group for Sarcopenia (AWGS)
    - Racial, environmental and cultural differences were taken into consideration
- 2016
  - ICD-10

History of sarcopenic dysphagia

- 2005
  - "Dysphagia due to sarcopenia"
    - Was first introduced as a term
- 2012
  - "Sarcopenic dysphagia"
    - Was first used in the paper published by Kuroda et al.

Robbins J, et al. The effects of lingual exercise on swallowing in older adults. J Am Geriatr Soc 2005.
Kuroda Y, et al. Relationship between thinness and swallowing function in Japanese older adults: implications for sarcopenic dysphagia. J Am Geriatr Soc 2012

Research papers and scientific presentations

- PubMed on 28 March 2018
  - Key words
    - “sarcopenia” and “dysphagia”
    - 68 articles
- PubMed on 30 March 2019
  - Key words
    - “sarcopenia” and “dysphagia”
    - 85 articles

Figure 1 Diagnostic algorithm for sarcopenic dysphagia. CC, calf circumference; DXA, dual-energy X-ray absorptiometry; BIA, bioimpedance analysis.

Table 1 Consensus diagnostic criteria for sarcopenic dysphagia

1)	Presence of dysphagia.
2)	Presence of generalized sarcopenia (generalized loss of skeletal muscle mass and strength).
3)	The results of imaging tests (computed tomography, magnetic resonance imaging, ultrasonography) are consistent with a loss of swallowing muscle mass.
4)	The causes of dysphagia are excluded except for sarcopenia.
5)	The main cause of dysphagia is considered to be sarcopenia (if other causes of dysphagia such as stroke, brain injury, neuromuscular diseases, head and neck cancer, and connective tissue diseases exist).
	Definite diagnosis: 1, 2, 3, 4
	Probable diagnosis: 1, 2, 4
	Possible diagnosis: 1, 2, 5

Conclusion

- How sarcopenic dysphagia should be diagnosed remains unsolved
- Studies
  - On the prevalence rate of dysphagia due to sarcopenia
  - On the prevention and treatment of sarcopenic dysphagia

EnM
ENDOCRINOLOGY AND METABOLISM

Review Article

Endocrinol Metab 2018;33:435-444
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Effects of Resistance Exercise on Bone Health

A Ram Hong[1], Sang Wan Kim[2]

[1]Department of Internal Medicine, Chonnam National University Medical School, Gwangju; [2]Department of Internal Medicine, Seoul National University College of Medicine and Seoul Metropolitan Government Seoul National University Boramae Medical Center, Seoul, Korea

Table 1. The Type of Resistance Exercise Training Program

Type	Description	Examples
Isometric RE	A static contraction of muscle against external resistance without change in its length or joint motion	Yoga poses such as Plank or the Warrior variations, side bridge, hundred breaths exercise, pushing against a fence
Isotonic RE	A dynamic exercise against resistance as a muscle lengthens or shortens through the available range of motion	
	- Concentric contraction: an active muscle undergoes shortening while overcoming external resistance	Contraction of biceps curl with fixed weight
	- Eccentric contraction: an active muscle undergoes lengthening while being overcome by an external resistance	Extension of quadriceps during knee bend
Isokinetic RE	An active exercise in which a muscle or group of muscles contracts against a controlled accommodating resistance that is moving at a constant angular velocity	Fitness machines (e.g., stationary bike, bench press machine, bent-over row), dynamometer

RE, resistance exercise.

CONCLUSIONS

- RE are important for the musculoskeletal health
- Stimulates muscle protein synthesis
  - Activates a PI3K-Akt-mTORC1 signaling pathway
- Exerts a mechanical load on bones consequently leading to increase in the bone strength
- Improves muscle and bone mass in postmenopausal women, middle-aged men, or even the older population
  - There are no data on the anti-fracture effect of RE

Mech Ageing Dev. 2019 Mar;178:9-15. doi: 10.1016/j.mad.2018.12.001. Epub 2018 Dec 7.

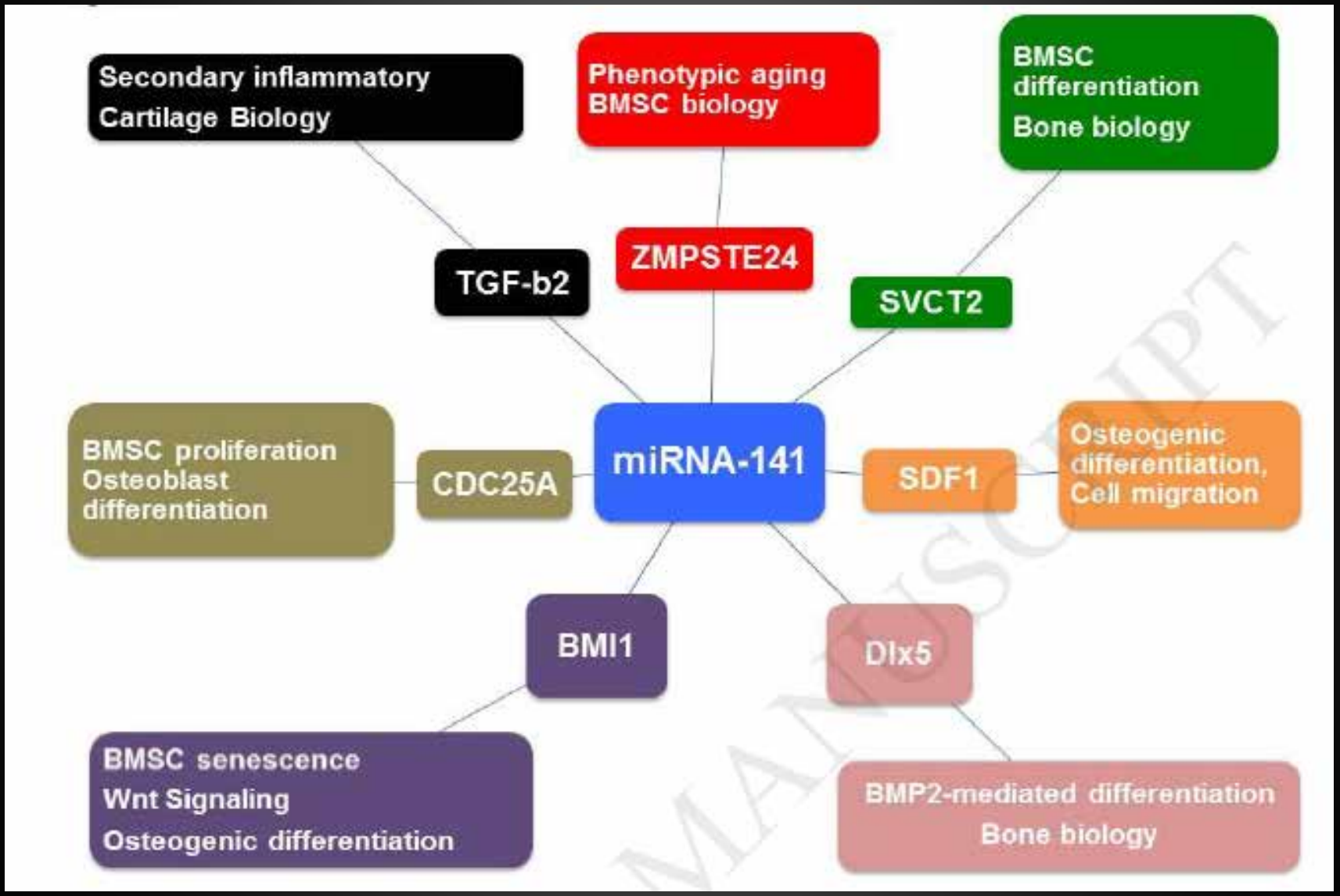
Role of MicroRNA-141 in the Aging Musculoskeletal System: A Current Overview.

Fariyike B[1], Singleton Q[1], Hunter M[1], Hill WD[2], Isales CM[3], Hamrick MW[4], Fulzele S[5].

Author information

- MiRNAs play a role in several cellular functions which include musculoskeletal development and pathophysiology
- There is growing evidence that miRNA's can regulate bone homeostasis and osteogenesis, which could make them potential therapeutic targets in degenerative bone disease and fracture healing
- One miRNA that has been of interest is miRNA-141, a member of the miRNA 200 family.
- Literature has shown that miRNA 141 targets several genes known to be critical for bone mesenchymal stem cell (BMSC) migration, differentiation, and survival

- Aim
- To summarize the potential role of miRNA 141 in degenerative musculoskeletal pathology


Secondary inflammatory
Cartilage Biology
Phenotypic aging
BMSC biology
BMSC
differentiation
Bone biology
TGF-b2
ZMPSTE24
SVCT2
BMSC proliferation
Osteoblast
differentiation
CDC25A
miRNA-141
SDF1
Osteogenic
differentiation,
Cell migration
BMI1
Dlx5
BMSC senescence
Wnt Signaling
Osteogenic differentiation
BMP2-mediated differentiation
Bone biology

- MIRNA-141 negatively regulate stem cell differentiation
- Oxidative and inflammatory stress regulate MiRNA-141
- MiRNA-141 dysregulated with aging and the aging musculoskeletal phenotype
- Antagonists of miR-141 could potentially be therapeutic agents to address age-related musculoskeletal diseases.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