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In Collaborazione con

frontiers

1. Postoperative Nutrition and Recovery Outcomes After Anterior Cruciate Ligament Reconstruction: A Systematic Review

Authors: Alfano Francesco, Bevilacqua Matteo, De Gennaro Mario Pio, Mosca Gaetano, Ruocco Gianfranco, Luigi Schiavo
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Abstract:
Anterior cruciate ligament (ACL) reconstruction is one of the most common orthopedic procedures among athletes and is frequently associated with prolonged rehabilitation, quadriceps muscle atrophy, systemic inflammation, and delayed return to sport. Emerging evidence suggests that postoperative immobilization induces a transient anabolic resistance state that may accelerate skeletal muscle loss if not counteracted by targeted nutritional strategies. While physical therapy remains the cornerstone of rehabilitation, nutritional optimization is increasingly recognized as an integral component of postoperative recovery.
This systematic review aimed to evaluate the efficacy of specific nutrients, dietary interventions, and supplementation protocols in promoting functional and structural recovery following ACL reconstruction. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines. Studies published between January 2015 and March 2026 investigating nutritional interventions in patients undergoing ACL reconstruction were included. Outcomes of interest comprised muscle mass preservation, strength recovery, inflammatory markers, pain perception, and return-to-sport outcomes. More than 20 studies involving more than 1,400 participants were included. Current evidence highlights the therapeutic role of adequate protein intake, essential amino acids (EAAs), collagen peptides, omega-3 fatty acids, vitamin D, and creatine monohydrate. High-protein diets (1.6–2.2 g/kg/day), consistent with International Society of Sports Nutrition recommendations, were associated with reduced muscle atrophy and attenuated strength loss during the early immobilization phase. Furthermore, collagen supplementation combined with vitamin C demonstrated promising effects on tendon graft remodeling and extracellular matrix synthesis, while omega-3 fatty acids reduced systemic inflammatory markers without impairing tissue healing. In conclusion, personalized nutritional support represents a valuable adjunctive strategy in ACL rehabilitation and may accelerate functional recovery and return-to-sport outcomes. Future randomized controlled trials are warranted to develop standardized, evidence-based nutritional protocols for postoperative ACL rehabilitation.

2. Targeting the Nutrition–Microbiota–Muscle Axis in Post-Traumatic Rehabilitation: A Systematic Review

Authors: Chirico Mario, De Rosa Maria Pina, Della Monica Anna, Garofalo Manuel, Torre Toni, Vitiello Giovanni, Luigi Schiavo
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Abstract:
Post-traumatic rehabilitation is a complex process involving not only musculoskeletal recovery, but also profound systemic inflammatory and metabolic alterations. Emerging evidence suggests that the gut microbiota plays a central role in skeletal muscle physiology through the gut–muscle axis, influencing muscle protein synthesis, mitochondrial function, immune regulation, and recovery capacity. Consequently, targeted nutritional interventions aimed at modulating the microbiota have gained increasing attention as potential adjunctive strategies in rehabilitation medicine. This systematic review aimed to evaluate the impact of microbiota-targeted nutritional interventions on muscle recovery, inflammation, and functional outcomes in patients undergoing post-traumatic rehabilitation. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2018 and March 2026. Randomized clinical trials, observational studies, and systematic reviews investigating the interaction between nutrition, gut microbiota, and muscle recovery in orthopedic or neurological rehabilitation settings were included. Outcomes of interest included inflammatory biomarkers, muscle strength, functional performance, and rehabilitation time. A total of 27 studies involving more than 1,900 participants were analyzed. Current evidence suggests that post-traumatic dysbiosis may contribute to reduced short-chain fatty acid (SCFA) production, increased intestinal permeability, and impaired anabolic signaling pathways involved in muscle regeneration. Nutritional interventions based on probiotics, prebiotics, fermentable fibers, omega-3 fatty acids, and high-protein diets were associated with reductions in circulating inflammatory markers, including TNF-α and IL-6, together with improvements in muscle strength, lean mass preservation, and functional recovery. Several randomized studies reported improvements in physical performance ranging from 10% to 18% following combined nutritional and rehabilitative interventions. In conclusion, microbiota-targeted nutritional support represents a promising translational strategy in post-traumatic rehabilitation. Future large-scale randomized controlled trials are warranted to establish standardized evidence-based protocols and clarify the clinical relevance of the gut–muscle axis in rehabilitation outcomes.

3. Vitamin D, muscular strength and injury prevention: A systematic review

Authors: Angelo Musella, Vittorio Betteghella, Christian Castrignano, Mattia Giura, Manuele Serretiello and Luigi Schiavo.
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Abstract:
Vitamin D plays a central role in musculoskeletal health, influencing muscle protein synthesis, neuromuscular function, calcium homeostasis, and skeletal integrity through vitamin D receptor (VDR) activation in muscle tissue. In recent years, increasing attention has focused on the relationship between vitamin D status, muscular performance, and injury prevention in both athletes and older adults. This systematic review aimed to evaluate the effects of vitamin D status and supplementation on muscular strength, physical performance, and musculoskeletal injury risk.
A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2015 and March 2026. Randomized controlled trials, meta-analyses, and observational studies investigating vitamin D and muscle-related outcomes in athletes or physically active individuals were included. Outcomes of interest comprised muscle strength, neuromuscular performance, falls, stress fractures, and musculo-tendinous injuries. A total of 32 studies involving more than 3,500 participants were analyzed. Current evidence suggests that vitamin D deficiency is associated with reduced muscle strength, impaired neuromuscular coordination, and increased susceptibility to stress fractures and musculo-tendinous injuries. Supplementation in deficient individuals, particularly in subjects with serum 25(OH)D levels below 20 ng/mL, was associated with improvements in lower-limb strength, balance, and recovery outcomes. Several studies reported reductions in stress fracture incidence ranging from 15% to 25% following vitamin D optimization, particularly among athletes exposed to high training loads. Conversely, supplementation in individuals with adequate baseline vitamin D levels showed limited additional benefits on muscle performance. In conclusion, vitamin D screening and personalized supplementation strategies may represent valuable tools for optimizing musculoskeletal performance and reducing injury risk. Further large-scale randomized controlled trials are needed to define evidence-based thresholds and supplementation protocols in sports medicine and rehabilitation.

4. The role of nutrition and physical exercise in maintaining muscle mass post-bariatric surgery: A Systematic Review

Authors: Pietro Cangemi, Riccardo De Simone, Alessandro Malafronte, Mario Letteriello, Antonio Vitolo and Luigi Schiavo
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Abstract:
Bariatric and metabolic surgery represents the most effective long-term treatment for severe obesity and obesity-related comorbidities. However, rapid postoperative weight loss is frequently accompanied by a significant reduction in fat-free mass (FFM), particularly skeletal muscle mass, potentially increasing the risk of secondary sarcopenia, reduced physical performance, metabolic adaptation, and long-term weight regain. Consequently, strategies aimed at preserving muscle mass have become a major focus in postoperative bariatric care.
This systematic review aimed to evaluate the role of targeted nutritional interventions and structured physical exercise programs in maintaining muscle mass and improving functional outcomes after bariatric surgery. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2015 and March 2026. Randomized controlled trials, observational studies, and systematic reviews investigating nutritional strategies and exercise interventions after bariatric surgery were included. Outcomes of interest comprised changes in fat-free mass, muscle strength, physical performance, metabolic parameters, and weight regain. A total of 34 studies involving more than 4,200 patients were analyzed. Current evidence indicates that postoperative patients may lose approximately 15–25% of total weight as lean mass during the first postoperative year. Higher protein intake (1.2–1.5 g/kg ideal body weight/day), combined with essential amino acid supplementation, was consistently associated with improved preservation of muscle mass and functional capacity. Furthermore, resistance training initiated during the early postoperative phase demonstrated significant benefits in maintaining FFM, muscle strength, and resting metabolic rate compared with standard care alone. Combined aerobic and resistance exercise programs also improved cardiorespiratory fitness and overall metabolic health. In conclusion, integrated nutritional and exercise-based interventions represent key strategies for preserving skeletal muscle mass after bariatric surgery. Future randomized controlled trials are warranted to establish standardized evidence-based protocols for postoperative sarcopenia prevention and long-term metabolic optimization.

5. Weight cutting in female judo. Impact on energy availability, performance, and health: A Systematic Review

Authors: Cavaliere Angelica, Celotto Ida, Rispoli Martina, Salvato Nunzia, Vertolomo Rosa, and Luigi Schiavo
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Abstract:
Rapid weight loss (RWL) is a widespread practice in weight-category sports such as judo, affecting up to 90% of female athletes who commonly reduce 2–5% of body mass in the days preceding competition. Although intended to provide a competitive advantage, aggressive weight-cutting strategies may induce low energy availability and significant metabolic, hormonal, and psychological stress. In female athletes, these alterations may contribute to impaired performance and increase the risk of conditions associated with Relative Energy Deficiency in Sport. This systematic review aimed to evaluate the effects of rapid weight loss on physical performance, cognitive function, endocrine health, and psychological well-being in female judoka. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2010 and March 2026. Randomized trials, observational studies, and systematic reviews investigating weight-cutting practices in female judo athletes were included. Outcomes of interest comprised neuromuscular performance, hydration status, hormonal alterations, mood disturbances, eating behaviors, and competitive outcomes. A total of 29 studies involving more than 2,300 female athletes were analyzed. Current evidence suggests that rapid weight loss negatively affects balance, reaction time, anaerobic performance, and tactical decision-making during competition. Several studies reported significant increases in fatigue, tension, and anger following aggressive weight-cutting protocols, while post-weigh-in binge eating behaviors were observed in up to 65% of athletes. Furthermore, chronic low energy availability was associated with menstrual dysfunction, impaired recovery, and altered bone health, particularly in adolescent competitors. Notably, no consistent evidence demonstrated improved competitive success following aggressive weight reduction strategies. In conclusion, rapid weight loss practices in female judo may compromise both physiological health and athletic performance without clear competitive benefits. Evidence-based nutritional strategies, individualized monitoring, and professional dietary counseling are essential to preserve athlete health and optimize long-term performance outcomes.

6. Nutritional Epigenetics and Mechanotransduction: Integrated Implications for Muscle Recovery in Physiotherapy and Nutritional Sciences: A Systematic Review

Authors: Russo Gaetano, Aliberti Pietro, Brescia Filippo, Borrelli Pasquale, Grande Felice, and Luigi Schiavo
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Abstract:
Skeletal muscle recovery is regulated by the interaction between mechanical stimuli, nutritional factors, and epigenetic mechanisms. Emerging evidence suggests that exercise-induced mechanotransduction and nutrition-mediated epigenetic modulation play a central role in muscle regeneration, adaptation, and functional recovery. In particular, pathways involving mTOR, MAPK, YAP/TAZ, and mitochondrial biogenesis appear closely interconnected with DNA methylation, histone modifications, and non-coding RNA regulation. These molecular adaptations may contribute to the concept of "epigenetic muscle memory," whereby previous exercise and nutritional exposures influence subsequent regenerative responses. This systematic review aimed to evaluate the role of nutritional epigenetics and mechanotransduction in skeletal muscle recovery and rehabilitation outcomes. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2012 and March 2026. Randomized controlled trials, observational studies, translational investigations, and systematic reviews examining the interaction between exercise, nutrition, epigenetic regulation, and muscle recovery were included. Outcomes of interest comprised muscle protein synthesis, mitochondrial adaptation, inflammatory modulation, satellite cell activation, and functional recovery. A total of 31 studies involving more than 2,100 participants were analyzed. Current evidence suggests that resistance exercise induces rapid hypomethylation of genes involved in oxidative metabolism and mitochondrial biogenesis, including PGC-1α, thereby enhancing anabolic responsiveness and muscle adaptation. Nutritional strategies based on adequate protein intake, essential amino acids, omega-3 fatty acids, and polyphenol-rich dietary patterns were associated with improved activation of anabolic signaling pathways and reduced inflammatory responses. Several studies also reported enhanced muscle recovery and functional performance following combined exercise and targeted nutritional interventions compared with

rehabilitation protocols alone. In conclusion, the integration of mechanotherapy and precision nutrition may represent a promising translational strategy for optimizing skeletal muscle recovery. Future large-scale studies are warranted to clarify the clinical relevance of epigenetic adaptations and to develop evidence-based rehabilitation protocols integrating exercise and nutritional sciences.

7. Glycemic Index and Rehabilitative Performance After Injury: A Systematic Review

Authors: Fontana Maria Vittoria, Granozi Antonio, Pagnozzi Giosuè, Pierro Caterina, Pisciotta Gianmarco, and Luigi Schiavo
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Abstract:
Musculoskeletal injuries induce profound metabolic and inflammatory alterations that may negatively affect tissue repair, muscle recovery, and functional rehabilitation. In recent years, increasing attention has focused on the role of dietary glycemic modulation in optimizing post-injury recovery. The glycemic index (GI), which reflects the impact of carbohydrate-containing foods on postprandial glucose and insulin responses, may influence energy availability, oxidative stress, inflammation, and skeletal muscle metabolism during rehabilitation. This systematic review aimed to evaluate the effects of dietary glycemic index on metabolic control, inflammatory response, and rehabilitative performance following musculoskeletal injury. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2012 and March 2026. Randomized controlled trials, observational studies, and systematic reviews investigating glycemic modulation and rehabilitation outcomes were included. Outcomes of interest comprised insulin sensitivity, inflammatory biomarkers, muscle recovery, fatigue perception, and functional performance. A total of 24 studies involving more than 1,800 participants were analyzed. Current evidence suggests that low-glycemic dietary strategies are associated with improved glycemic stability, enhanced insulin sensitivity, and reduced oxidative and inflammatory stress during rehabilitation. Several studies reported reductions in circulating inflammatory markers, including C-reactive protein and IL-6, together with improvements in perceived fatigue and muscle recovery. Furthermore, stable glycemic control appeared to support GLUT-4-mediated glucose uptake and improve metabolic efficiency during physiotherapeutic recovery protocols. Combined nutritional approaches integrating low-glycemic carbohydrates with adequate protein intake were also associated with better preservation of lean mass and functional performance compared with standard dietary interventions. In conclusion, low-glycemic nutritional strategies may represent a valuable adjunctive approach in post-injury rehabilitation by supporting metabolic stability, reducing inflammation, and enhancing recovery efficiency. Future randomized controlled trials are warranted to establish evidence-based dietary protocols integrating nutritional and rehabilitative sciences.

8. Nourishing the structure, rehabilitating the function: an integrated physio-nutritional intervention to reverse the effects of RED-S in the prevention of patellar tendinopathy ("jumper's knee") in volleyball: A Systematic Review

Authors: Castagno Valentina, De Filippis Martina, De Filippo Grazia, Grimaldi Linda, Santaella Mariangie Susana, Tenza Martina and Luigi Schiavo
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Abstract:
Relative Energy Deficiency in Sport is a syndrome characterized by chronic low energy availability resulting from an imbalance between dietary intake and exercise-related energy expenditure, leading to endocrine, metabolic, musculoskeletal, and functional impairments. In athletes involved in jumping sports such as volleyball, RED-S may negatively affect tendon metabolism and collagen turnover, increasing susceptibility to patellar tendinopathy (PT), commonly known as "jumper's knee." PT represents one of the most frequent overuse injuries in elite volleyball athletes, with reported prevalence rates approaching 40–50%. This systematic review aimed to evaluate the effects of integrated nutritional and physiotherapeutic interventions on tendon recovery, functional performance, and prevention of patellar tendinopathy in athletes with RED-S. A systematic search of PubMed, Scopus, and Web of Science was conducted according to PRISMA guidelines, including studies published between January 2012 and March 2026. Randomized controlled trials, observational studies, and systematic reviews investigating nutritional strategies, collagen supplementation, and tendon-loading rehabilitation protocols were included. Outcomes of interest comprised VISA-P score, pain reduction, tendon recovery, collagen synthesis, and return-to-sport outcomes. A total of 26 studies involving more than 1,700 athletes were analyzed. Current evidence suggests that low energy availability and hormonal alterations associated with RED-S impair tendon healing and recovery capacity. Several studies reported that collagen or gelatin supplementation combined with vitamin C administered before loading exercise enhanced collagen synthesis and improved tendon adaptation. In particular, supplementation protocols providing 10–15 g of hydrolyzed collagen or gelatin with 40–50 mg of vitamin C before progressive tendon-loading exercise were associated with significant improvements in VISA-P scores, pain reduction, and functional recovery compared with rehabilitation alone. In conclusion, integrated physio-nutritional strategies targeting energy availability, collagen synthesis, and progressive tendon loading may represent a promising translational approach for the prevention and management of patellar tendinopathy in athletes with RED-S. Further randomized controlled trials are warranted to establish standardized evidence-based rehabilitation protocols.

9. EFFECTS OF SEMAGLUTIDE ON BODY COMPOSITION IN INDIVIDUALS WITH OBESITY: NUTRITIONAL AND EXERCISE STRATEGIES FOR LEAN MASS PRESERVATION.

Authors: Rossella Guarino[1], Maria Chiara De Angelis[1], Biagio Santella[1,2], Francesca Milite[1], Carla Cimmino[4,5], Annalisa Giordano[6], Sarah Di Lauro[7], Angela Cassese[8], Luigi Schiavo[3], Vincenzo Cosimato[1]

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Abstract:
Semaglutide, a GLP-1 receptor agonist used for type 2 diabetes and obesity, induces significant weight loss mainly through fat mass reduction, although lean mass loss may also occur. This has raised concerns regarding potential effects on muscle mass and long-term metabolic health. This narrative review aimed to evaluate the effects of semaglutide on body composition and the role of nutritional and

exercise interventions in preserving lean mass. Clinical trials, reviews, and meta-analyses published between 2024 and 2026 investigating semaglutide and body composition in obesity were analyzed.
In obese individuals treated with semaglutide, body weight reductions of up to 14.9% were observed, primarily driven by decreases in fat mass of up to 24.7%. However, lean mass loss accounted for 15-40% of total weight loss across studies. This variability appears related to the population, treatment characteristics, and comorbidities. Recent evidence suggests that weight loss is mainly due to fat mass reduction, while losses in muscle and lean mass are relatively limited. Several studies also reported improvements in overall body composition and an increased proportion of lean mass relative to body weight. Changes in lean mass do not necessarily reflect changes in muscle mass or function. Adequate protein intake and physical exercise, especially resistance training, appear effective in preserving muscle mass during weight loss. High-protein diets (>1.2 g/kg/day) and resistance exercise were associated with better lean mass preservation. Further studies are needed to clarify the long-term effects of treatment on physical performance and functional capacity.

10. Association Between ACTN3 R577X Polymorphism and Athletic Performance in Elite Basketball Players

Authors: Antonio Imperatore[1], Cristina Mennitti[1,2], Fernanda Iafusco[2,3], Mariella Calvanese[1], Fabiana Di Fusco[1], Chiara Rosato[1], Gaetano Iaquinto[4], Mattia Digno[4], Salvatore Tamburro[5], Daniela Terracciano[6], Giulia Frisso[1,3], Paola Borrelli[7], Nadia Tinto[1,2,3], Olga Scudiero[1,2,3,8]

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Abstract:
Athletic performance is determined by the interaction between genetic and environmental factors, including training, nutrition, recovery, hormonal balance, and psychophysiological status. Among the genes associated with sport-related traits, ACTN3 and its R577X polymorphism (rs1815739) have been extensively linked to muscle function and athletic performance, although emerging evidence suggests broader effects on metabolic and inflammatory phenotypes. This study investigated the association between ACTN3 genetic variability, biochemical markers, and physical performance in elite athletes. A total of 109 athletes from different sports disciplines were enrolled, including synchronized swimmers, basketball and water polo players. Genotyping of the ACTN3 R577X polymorphism was performed by Sanger sequencing. Biochemical parameters, including creatine kinase (CK), C-reactive protein (CRP), lipid profile, and neutrophil-to-lymphocyte ratio (NLR), were assessed. In a subgroup of 28 professional basketball players, genotype data were further correlated with standardized physical performance tests. Genotype distribution differed according to ancestry, with the RR genotype more frequently observed among athletes of African descent. XX carriers showed a trend toward a less favorable lipid profile, whereas RR individuals exhibited higher CK levels. No statistically significant genotype-dependent differences in athletic performance were detected, although RR carriers tended to achieve better results in sprint-related tests. In addition, two further ACTN3 variants were identified, including a synonymous variant associated with inflammatory and metabolic markers. These findings support a role for ACTN3 genetic variability not only in athletic performance but also in metabolic and inflammatory regulation, highlighting its potential relevance for personalized training and metabolic risk stratification in elite athletes.

11. Integrating body composition ultrasound and bioimpedance in assessing the effects of a ketogenic diet and resistance training program on fat mass and skeletal muscle mass: a case report in a male adult

Authors: Giuseppe Annunziata [1], Giuseppe Cerullo [2], Matteo Pincella [3], Claudio Pecorella [3], Natale Gentile [4], Luigi Barrea [5], Francesco Campa [2]

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Abstract:
In sports nutrition, optimizing body composition (BC) is a primary goal for athletes across multiple disciplines. The ketogenic diet (KD) has emerged as a nutritional strategy capable of promoting favorable shifts in body BC without negatively affecting muscle tissue. This single-subject case report investigated the effects of a 28-day 2000 kcal KD (carbohydrates 21g, 5%; lipids 155g, 70%; protein 130g, 25%) combined with resistance training (RT) 4 times weekly on BC in a male athlete (age: 36 years). BC was assessed through two validated field methods: bioelectrical impedance analysis (BIA) (BIVA PRO, Akern Ltd) and B-mode ultrasound (US) (Ultracomp One, Hitasonix). Both methods are portable, non-invasive, and well-suited for longitudinal BC monitoring in sport settings, offering a practical alternative to laboratory-based reference techniques. Following the intervention, body mass decreased from 91.2 to 84.9 kg. BIA-derived fat mass (FM) declined from 21.2% (19.9 kg) to 17.6% (15.5 kg), while US-derived FM showed a concordant reduction from 21.9% (20.0 kg) to 18.2% (15.5 kg), indicating a substantial and consistent loss of adipose tissue. Skeletal muscle mass (SMM) was largely preserved, from 32.2 to 31.9kg and 34.4 to 33.9kg, with BIA and US estimates, respectively. Phase angle improved from 7.6° to 8.0°, which may indicate improved cellular integrity. These findings suggest that, in this athlete, a KD combined with RT may promote FM reduction while largely preserving SMM, with BIA and US showing comparable trends in BC changes.

12. Anthropometric characteristics in different sports: early evidence toward a shared research network

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Abstract:
Anthropometric traits differ among sports and are influenced by both performance requirements and long-term training exposure. Nevertheless, it is still uncertain whether athletes can be clearly categorized into distinct morphological groups or whether these characteristics exist along a continuous spectrum. This study aimed to describe anthropometric differences across sport categories and the creation of a standardized collaborative database for future research.
A total of 523 participants were assessed by 16 anthropometrists certified by ISAK. Participants were classified into six sport categories: endurance, tall/linear, contact, strength, mixed/skill, and exercisers. Only group including at least 10 participants per sex were considered for statistical analyses. Descriptive analyses, one-way ANOVA, and post-hoc tests were conducted separately for males and females. A principal component analysis (PCA) was applied to identify underlying anthropometric variability. Significant differences across sport categories were found for all anthropometric variables ($p<0.001$). Male athletes involved in contact sports presented higher body mass and skinfolds sum, whereas endurance athletes showed lower values. Differences were less evident in females. PCA indicated that anthropometric variation was mainly explained by overall body size (PC1, 66.1%) and body proportionality (PC2, 19.0%), with considerable overlap between categories. Overall, although anthropometric profiles differ across sport disciplines, they appear to be distributed along a continuum rather than forming discrete clusters. These findings highlight the need of developing larger and more harmonized datasets.

13. Validation of a New Binary-Tracking Image Analysis System for Body Composition Ultrasound

Authors: Francesco Campa[1], Massimiliano Pellegrini[1], Giuseppe Cerullo[1], Marco Santucci[2], Antonio Paoli[1], Martino Franchi[1]
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Abstract:
Ultrasound (US) imaging is an increasingly attractive tool for quantitative body composition assessment due to its non-invasive nature and ability to provide site-specific information on fat distribution. Nevertheless, its practical application is often hindered by the time-consuming and operator-dependent nature of offline image processing using manual methods such as ImageJ. To address these limitations, a novel binary-track image analysis system based on predefined parallel tracks was developed to enable real-time quantification and streamline the assessment process. This study evaluated the agreement between this novel system and conventional ImageJ analysis, its consistency across different US devices, and its validity against dual-energy X-ray absorptiometry (DXA). Subcutaneous adipose tissue thickness was measured at five sites (biceps, triceps, abdominal, thigh, and calf) in 29 participants. Agreement between methods was high to excellent across all sites ($r=0.875$-0.995; $ICC=0.878$-0.995). Bland-Altman analysis for the summed thicknesses revealed a negligible mean bias of 0.019 cm ($p=0.169$), with no evidence of proportional bias. Fat mass estimates from the binary-track system showed high validity against DXA ($r=0.960$; $ICC=0.960$) and lower prediction error (MAE=1.55 kg; RMSE=2.17 kg) compared to manual analysis. High consistency was also maintained across different ultrasound devices. These findings suggest the binary-track system provides an accurate, reliable, and efficient alternative for adipose tissue assessment, enhancing the practical applicability of B-mode ultrasound in clinical and research settings.

14. Effects of Mediterranean Diet and aerial training on body composition in recreational aerial dancers.

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Abstract:
Aerial dance is an acrobatic art which provides a full body work out. Recreationally, aerial dance is gaining popularity as a fitness program. Nonetheless, there are no data available on body composition in aerial dancers.
The aim of the present study was to evaluate the effect of Mediterranean Diet (MedDiet) and aerial training on body composition in recreational aerial dancers. 20 adult women were recruited (mean age 27,5 years). All aerial dancers were treated with a MedDiet personalized balanced nutritional scheme, associated with an aerial training program twice a week (1,5h per session). Anthropometric measurements, body mass index (BMI) and body composition (through Bioimpedance Analysis) were assessed at baseline (t0), 1- and 2-year follow-up (t1 and t2). After 1-and 2-year follow up, a significant reduction in BMI was observed (23.19±1.87 vs 22.43 ± 1.55 vs 22.06±1.47; $p<0.001$). The patients showed significant improvements in body composition, revealing higher total body water (TBW) 32.65±3.33 (t0), 33.32±3.73 (t1), 33.49±3.69 (t2), $p< 0.016$; a reduction in fat mass (FM) 15.85±5.35 (t0) vs 12.88±3.78 (tl) vs 11.81±3.49 (t2), $p<0.001$, and an improvement in phase angle (PhA) 6.54±0.76 (t0) vs 6.88±0.6 (t1) vs 6.97±0.77 (t2), $p<0.005$. In conclusion, regular practice of aerial dance, combined with a tailored MedDiet nutritional scheme can contribute to a significant improvement in the body composition.

15. Sex-specific anthropometric characteristics in elite karate athletes: implications for body composition and performance

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Abstract: Body composition and anthropometric profiling are relevant in weight-category combat sports, where morphology, fat distribution and weight management may influence training and performance. However, sex-specific data in high-level karate athletes remain limited. This descriptive study compared selected anthropometric characteristics of male and female karate practitioners competing at national and international level. Eight athletes, 4 males and 4 females, were assessed during an official training camp held in Cercola, Italy, under the patronage of FIJLKAM. Measurements were performed by ISAK Level 2 certified anthropometrists according to standardized procedures and included body mass, stature, eight skinfolds, selected girths and bone breadths. Derived variables included the sum of six and eight skinfolds, arm span-to-height ratio and Heath-Carter somatotype components. Given the small sample size and variability in weight categories, data were reported as median and range. Females showed higher subcutaneous adiposity than males, with median 28 skinfolds of 104.8 mm, range 70.8-146.1, versus 82.6 mm, range 41.5-86.0. Higher thigh and calf skinfolds suggested a more peripheral fat distribution in females. Males showed greater values related to muscularity and skeletal structure, with a predominantly mesomorphic somatotype. These preliminary findings describe sex-specific anthropometric patterns and support individualized, sport-specific body composition strategies in elite karate.

16. Impact of Physical Activity Levels on Anthropometry and Body Composition in Pediatric Severe Obesity

Authors: Mantovano S., Muscariello E., Forte S., Mastantuono T., Antignani A., Di Geronimo O., Battiloro L., Visone A. and Pecoraro P. Local Health Authority Napoli 3 Sud, Department of Prevention, Food and Nutrition Hygiene Service

Abstract:
Physical inactivity represents a major public health concern in the pediatric population, with international surveillance documenting insufficient daily movement and a progressive decline in motor competence across childhood. These trends are particularly pronounced among youth with obesity, in whom low activity levels further amplify metabolic risk and functional limitations. The aim of this study was to evaluate physical activity levels in children with obesity and to examine their association with anthropometric parameters and body composition. A total of 112 patients, aged 6-10 years (53.6% male), attending the Second Level Assistance Center for Obesity in Childhood of the Local Health Authority "Napoli 3 Sud" were enrolled. Anthropometric measurements were collected, BMI z-scores were calculated, and body composition was assessed. Children's Physical Activity Questionnaire (CPAQ) was administered to all participants. Physical activity assessment revealed a marked inactivity pattern: 85% of the sample was classified as sedentary (CPAQ score 1.5±0.2), whereas only 15% demonstrated moderate activity levels (CPAQ score 2.1±0.1). All subjects showed elevated BMI z-scores (3.4±0.7), confirming universal classification within the severe obesity range.
Moderately active children showed a significantly lower BMI z-scores (3.53±0.7 vs 2.75±0.7; p=0.001), reduced fat mass (37.6±3.4% vs 34±5.7% p=0.002) and higher fat-free mass (62.4±3.9 vs 65.9±5.7%; p=0.002) compared with sedentary peers. Overall, these data describe a pediatric cohort characterized by severe obesity and insufficient physical activity. The differences in body composition between sedentary and moderately active children underscore the need for structured interventions aimed to increase habitual movement, reducing sedentary behaviors and mitigating long-term metabolic risk.

17. Incidental Diagnosis of Mild Hemophilia A and α-Thalassemic Trait During Pre-Participation Screening in a Professional Basketball Player

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Abstract:
Medical assessment in elite athletes is primarily aimed at identifying cardiovascular conditions associated with sudden cardiac death; however, it may occasionally disclose silent hematological or hemostatic abnormalities requiring specialized evaluation. Isolated prolongation of activated partial thromboplastin time (aPTT) represents a particularly challenging finding in asymptomatic individuals without a personal or familial bleeding history. We report the incidental diagnosis of mild hemophilia A associated with α-thalassemic trait in a professional basketball player undergoing periodical health screening. Initial laboratory workup demonstrated isolated aPTT prolongation, while prothrombin time and platelet count were within normal ranges (n.r). Despite long-term exposure to high-intensity physical activity, the athlete denied any clinically significant bleeding history. Second-level coagulation studies excluded lupus anticoagulant and von Willebrand disease, while intrinsic pathway factor assays demonstrated persistently reduced factor VIII activity (41%, n.r. 50-130) with otherwise preserved intrinsic coagulation factors. Hematological evaluation demonstrated persistent microcytic and hypochromic erythrocyte indices, with MCV, MCH, and MCHC values of 69.6 fL (n.r 80-98), 22.1 pg (n.r. 25-34), and 31.7 g/dL (n.r. 32-38), respectively, associated with relative erythrocytosis (7.34 × 10^6/μL; n.r. 4.5-5.6). Normal iron studies supported suspicion of an underlying hemoglobinopathy rather than iron deficiency anemia. Genetic analysis identified a functional hemizygous F8 gene polymorphism c.3780C>G, p.(Asp1260Glu) consistent with mild hemophilia A, while parallel molecular evaluation demonstrated homozygosity for the -α3.7 α-thalassemic deletion. This case highlights the importance of comprehensive laboratory assessment as a diagnostic approach to isolated aPTT prolongation in athletes, with potential implications for bleeding risk stratification, sports eligibility assessment, peri-procedural management, and long-term clinical surveillance.

18. Physical Activity Patterns and Motor Performance in Children With Obesity

Authors: Muscariello E., Mantovano S., Forte S., Mastantuono T., Antignani A., Di Geronimo O., Battiloro L., Visone A. and Pecoraro P. Local Health Authority Napoli 3 Sud, Department of Prevention, Food and Nutrition Hygiene Service

Abstract:
Physical inactivity is a key determinant of pediatric obesity, compromising the development of motor and functional skills during childhood. Understanding the types and levels of physical activity that influence motor performance is a public health priority for guiding targeted, evidence-based interventions. This study aimed to evaluate differences in physical performance among children with obesity according to both the type of activity (structured vs unstructured) and the activity level (sedentary vs moderately active).
A total of 112 obese children (6-10 years; 53.6% male; BMI z-score 3.4±0.7) attending the Second Level Assistance Center for Obesity in Childhood of the Local Health Authority "Napoli 3 Sud" were enrolled. BMI z-scores, body composition, vertical-jump-elevation (VJE), vertical-jump-power (VJP), visual-reaction-time (VRT), acoustic-reaction-time (ART), speed reps test and physical activity levels (CPAQ score) were assessed. Children performing structured activity (52%) showed lower fat mass (37.9±4.1 vs 36.2±4.5%; p=0.05) and higher fat-free mass (62.1±4.1 vs 63.8±4.5% p=0.05) compared with those performing unstructured activity (48%). However, no significant differences emerged in physical performance. In contrast, activity level sedentary (85%) vs moderate (15%), was associated with performance outcomes. Moderately active children showed higher VJE (10.99±2.4 vs 12.68±3.1 cm; p=0.012), greater VJP (7.6±0.9 vs 8.1±1.1 W/kg; p=0.05) faster VRT (0.86±0.1 vs 0.74±0.1 sec; p=0.001) and better speed reps test (46±13.8 vs 65±14.9 reps; p=0.001). In conclusion, while structured activity produced improvements in body composition, overall activity level emerged as the primary determinant of functional capacity, underscoring the importance of increasing total movement volume in children with obesity.

19. The Impact of a Ketogenic Diet on Hypertrophic Signalling and Body Composition in Resistance-Trained Males

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Abstract: The ketogenic diet (KD) is a nutritional approach characterized by high fat, adequate protein, and restricted carbohydrate intake (5% of total daily intake) that induces a state of physiological ketosis. However, metabolic adaptations may potentially interfere with muscle hypertrophy signaling pathways. Thus, this study sought to assess the impact of KD on muscle adaptation to resistance training (RT) in trained, healthy male subjects.
Nineteen subjects (28.7±8.1 years) were randomized to either a ketogenic (KD, n=10) or a control diet (CD, n=9), similar in terms of calories (35 kcal/kg body weight) and protein intakes (2 g/kg body weight). During the four-week intervention, participants followed the same RT protocol. Before and after the intervention period, hormonal profiles (IGF-1, insulin, total and free testosterone), resting metabolic rate, body composition (DXA), and muscle strength (1RM) were assessed. Muscle biopsies were obtained at rest and at 6 and 24 hours after a single RT session to evaluate the phosphorylation of regulatory signaling proteins (i.e., Akt, rpS6, 4E-BP1) via Western blotting. Preliminary findings show that in both groups, anabolic hormones and lean soft mass were not significantly affected. Nevertheless, pronounced fat loss was reported in KD (-8.06% vs +0.84%). Gains in muscle strength (1RM) and markers of the mTOR signaling pathway were also comparable between groups. In conclusion, four weeks of KD combined with RT seem to improve body composition without impairing anabolic response and post-exercise hypertrophic signaling.

20. Bioelectrical Markers and Skinfold Sum for Monitoring Athletic Condition

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Abstract: Physicians, trainers, and coaches need highly sensitive, specific, repeatable, and preferably non-parametric and operator-independent methods to assess and monitor an athlete's physical condition quickly and in a field-applicable manner. In laboratory settings, when equipped with appropriate instruments and staffed by experienced personnel, athletes can be evaluated using multiple physiological parameters to support comprehensive assessments and to implement targeted corrective or supportive interventions. However, during competitive events and acute performance phases, an athlete's physiological conditions can change rapidly. Even if an athlete starts from an optimal baseline, parameters measured just a few hours before competition may deteriorate quickly, compromising performance efficiency despite the athlete's preserved anatomical potential. For this reason, we compared two widely used, portable, and field-applicable methods: phase-sensitive bioelectrical impedance analysis (BIA) and the sum of seven skinfolds. Preliminary Conclusions: We found an unexpected correlation between the sum of seven skinfolds, total body capacitance, and phase angle. This led to the development of a novel BIA-based equation that predicts the sum of seven skinfolds with good accuracy using phase-sensitive 50 kHz BIA measurements. These preliminary findings may be clinically and operationally relevant due to the rapid execution time (approximately 3 minutes) and high repeatability of the method for monitoring intra-event hydration variations in sports activities such as soccer, where maintaining physiological hydration stability throughout prolonged competition differs significantly from that in speed running events.