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Mini Review

From Exercise Prescription to Human Functional Capacity Management: A Narrative Review and Conceptual Perspective

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Abstract

Exercise programs are generally described through frequency, duration, intensity, repetitions, and generalized measures of strength or fitness. Muscle Functional Capacity (MFC) proposes a different starting point: objective measurement of individual muscle groups relative to a defined reference capacity, followed by integration of the results with clinical and functional information to generate an individualized exercise prescription. A published 12-week pilot study involving 169 participants aged 16–94 years reported an increase in mean study-specific MFC from 57.06% to 75.17%, together with reductions in questionnaire scores relating to psychological stress, physical stress, quality of daily life, and disease-related burden. This narrative review and conceptual perspective describes the MFC framework, the reported pilot findings, and the longitudinal and population-level possibilities presented in the source texts. MFC is not currently a validated predictor of future injury or disease. Prospective longitudinal research is required to determine whether changes in muscle-group capacity can predict later functional outcomes.

Introduction

Exercise is important for health and functional independence. Resistance exercise supports muscle strength and function [1,2], while physical activity is associated with functional limitations and disability in older adults [3]. Conventional programs commonly begin with recommendations concerning frequency, duration, intensity, repetitions, and general measures of strength or fitness.

Muscle functional capacity (MFC) addresses a related question: what is the functional capacity of each measured muscle group relative to a defined reference, and how should intervention be adapted to that profile? MFC begins by measuring individual muscle groups, expressing each result relative to a reference capacity, and integrating the findings with clinical and functional information through a software-based method to generate an individualized exercise prescription [1].

The published study defined MFC as a muscle's ability to meet and sustain the demands of daily living, particularly under physical and psychological stressors [1]. This links muscle-group performance with daily function rather than treating strength as an isolated value. Related literature supports exercise prescription based on individual assessment [4] and shows that psychological factors can influence physical performance testing [5].

The aim of this narrative review is to describe the MFC framework, compare it conceptually with established assessment approaches, summarize the reported pilot findings, and identify the evidence required for further validation.

Narrative review approach

This review was prepared with attention to the SANRA domains for narrative reviews [6]. A targeted PubMed search was conducted through 7 September 2026 using combinations of the terms "muscle functional capacity," "muscle strength assessment," "one-repetition maximum," "grip strength," "isokinetic dynamometry," "functional performance test," "personalized exercise," "measurement properties," and "predictive validity." Reference lists of relevant articles were also examined. English-language peer-reviewed studies, systematic reviews, position statements, and seminal cohort studies directly relevant to the concept, comparator methods, or validation pathway were prioritized. The published MFC pilot study and the authors' conceptual text were used to define the proposed framework. This is a focused narrative synthesis; it is not a systematic review, and no formal risk-of-bias assessment or meta-analysis was performed.

What makes MFC different?

Established assessments address different components of muscle performance and function. The 1RM assesses maximal dynamic strength and generally shows high test–retest reliability, although familiarization, exercise selection, and participant experience can affect results [7]. Grip strength is simple and clinically informative but primarily reflects a specific task and muscle action rather than a multi-muscle profile [8]. Isokinetic dynamometry can quantify joint-specific strength under controlled velocities; evidence supports reliability under studied protocols, while measurement error and protocol dependence remain relevant [9]. Functional tests such as the Short Physical Performance Battery integrate balance, gait, and chair-rise performance and can predict adverse outcomes in older adults [10].

MFC is proposed as an integrative framework rather than a replacement for these methods. Its intended distinction is the combination of muscle-group-specific measurement, expression relative to a defined reference, longitudinal follow-up, and individualized intervention within one system. Table 1 summarizes this conceptual comparison; it does not represent a direct head-to-head validation study.

Reported pilot findings

The published pilot study included 169 participants aged 16–94 years with varied health conditions [1]. Participants completed a 12-week personalized resistance-exercise program consisting of three sessions per week, for a total of 36 sessions. The program used 13 EN-Dynamic pneumatic-resistance devices and custom prescription software, with muscle-group results measured before and after the program.

Each value was expressed as a percentage of the maximum measurable output of the corresponding device. Mean MFC increased from 57.06% (SD 14.13) to 75.17% (SD 12.19). The reported mean increase was 18.11 percentage points (95% CI 16.95–19.31), with Cohen's d = 2.35 [1]. The combined questionnaire score decreased from 142.08 (SD 23.37) to 109.57 (SD 18.01), with d = 1.42. The report described improvements in psychological stress, physical stress, daily-life limitations, and disease-related burden. All 169 participants completed the program without reported medical or procedural complications.

These findings demonstrate within-participant change during the intervention but do not establish comparative effectiveness, causal effects, or the measurement properties of MFC. The study had no non-exercising control group and did not directly compare the personalized method with conventional exercise [1].

Longitudinal use and required validation

Repeated measurement could describe whether muscle-group deficits are stable, improving, or progressing and whether targeted intervention is associated with change. Before such interpretation is dependable, the construct, reference values, protocol, reliability, measurement error, validity, and sensitivity to change must be evaluated using established measurement-property principles [11].

The conceptual text identifies military and security personnel and other critical operational groups as possible populations for future study. At the current level of evidence, this is a research proposition only. MFC should not be used for occupational selection, fitness-for-duty decisions, deployment clearance, or injury-prevention screening, because predictive validity has not been established.

Table 1: Comparison of MFC with established assessment approaches.

Capability	MFC	1RM	Grip Strength	Isokinetic Testing	Functional Tests
Individual muscle-group assessment	✓	◐	–	✓/◐	–
Capacity expressed relative to a defined reference.	✓	–	◐	◐	◐
Low dependence on examiner technique	✓	◐	✓/◐	✓	◐
Reproducible longitudinal monitoring	✓	◐	✓/◐	◐	◐
Normalized comparison across individuals	✓	–	◐	✓	◐
Identification of relatively deficient muscle groups	✓	◐	–	✓	–
Muscle-group-specific response to intervention	✓	◐	–	◐	–
Integration with clinical, functional and psychological data	✓	–	–	–	◐
Population analysis by age and sex within a common framework	✓	◐	✓	✓	✓
Potential surveillance before overt functional decline	✓	◐	–	◐	◐

Note: ✓ = directly supports the capability; ◐ = partially or under specific conditions; — = not a primary feature of the method.

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A staged validation pathway is therefore required:

1. **Measurement standardization:** define the MFC construct and reference capacity; standardize device calibration, positioning, testing, and software calculations; and establish test–retest and inter-rater reliability, measurement error, and construct validity across relevant groups [11].

2. **Longitudinal responsiveness:** determine whether observed changes exceed measurement error and correspond with accepted measures of strength, physical performance, and meaningful functional change.

3. **Prospective predictive validation:** follow prespecified cohorts to test whether baseline MFC or change in MFC predicts clearly defined outcomes such as injury or functional decline, while accounting for relevant clinical and occupational factors.

4. **Threshold and external validation:** for binary outcomes, evaluate discrimination, including the area under the receiver operating characteristic (ROC) curve, sensitivity and specificity at prespecified thresholds, calibration, and clinical usefulness. Any model or threshold must then be validated in independent sites and populations and reported transparently [12].

Only after successful completion of these phases could the suitability of MFC for screening or operational decision-making be considered. Until then, its supported role is limited to a proposed framework for individualized measurement and follow-up. Resistance exercise remains evidence-based for improving strength and function, including in older adults with sarcopenia [13], and musculoskeletal health remains central to healthy ageing [14].

Conclusion

MFC changes the starting question from "Which standardized exercise should be prescribed?" to "Which measured muscle-group capacities are relatively deficient, and how do they change over time?" The published pilot study reported substantial within-participant changes during a 12-week personalized program [1], but comparative effectiveness and predictive validity remain unestablished. The broader assessment literature supports the value of objective strength and functional testing while also showing that each method answers a specific question. MFC should therefore be regarded as a proposed integrative framework requiring standardized measurement studies, prospective cohorts, predictive analyses, and external validation before any screening application.

Declarations

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