


Hybrid HIIT/isometrics strength training programs: A paradigm shift for physical exercise

Luis Wyche. *Research Group in Sciences of Physical Activity and Sports. University of Alicante. Spain.*

Guillermo Rojo-Gil. *Research Group in Sciences of Physical Activity and Sports. University of Alicante. Spain.*

María Marín-Peiró. *Research Group in Sciences of Physical Activity and Sports. University of Alicante. Spain.*

 **José Antonio Pérez-Turpin.** *Research Group in Sciences of Physical Activity and Sports. University of Alicante. Spain.*

Jaime Enrique Gómez-Paternina. *Research Group in Sciences of Physical Activity and Sports. University of Alicante. Spain.*

 **Carlos Elvira-Aranda**  *Research Group in Sciences of Physical Activity and Sports. University of Alicante. Spain.*

Duncan Ayers. *Centre for Molecular Medicine and Biobanking. University of Malta. Malta.*

Faculty of Biology, Medicine and Health Sciences. The University of Manchester. Manchester, United Kingdom.

ABSTRACT

Global population statistics demonstrate clear evidence that unhealthy lifestyle choices - including hyper-caloric, low-nutritional density diets and sedentary lifestyle - are raising the global burden of diseases, morbidity and mortality at alarming rates. Healthy diets and exercise are recommended by all health care professionals as a proven treatment and prevention measure for health conditions, yet less than 10% of the population in some countries rigorously follow the minimum physical activity recommendations. In addition, many that do follow physical exercise-and-diet recommended guidelines do not achieve tangible results due to questionable methodologies of such programs. Furthermore, the recent COVID-19 pandemic dramatically affected global healthcare and has contributed to exacerbate the situation due to imposed lockdowns, where the costs of sedentary lifestyles threaten to bankrupt an already overtaxed public health care. Consequently, the public health worldwide desperately needs practical and cost-effective measures to reduce the effects of non-communicable diseases. Muscle mass hypertrophy-based physical exercise and biological adapted diet could provide the physiological solution, while novel game-based technology could help the challenges of exercise compliance. This review aims to, firstly, to revise the importance of achieving, maintaining and recovering muscle mass and strength for improved health outcomes. Secondly, evaluate the benefits of directing the focus of medical interventions towards hypertrophic exercise and diet as an effective treatment to improve health and longevity. Thirdly, we propose the CyFit SmartGym, a novel device, as a potential screening tool for monitoring strength levels and as a HIIT/strength training for improving and documenting health outcomes.

Keywords: Performance analysis of sport, Physical conditioning, Isometric training, Physical exercise, Muscle mass, Strength training.

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 **Corresponding author.** *University of Alicante, Spain.*

E-mail: cea.elvi@gmail.com

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INTRODUCTION

Presently, it is well established that poor lifestyle choices, particularly lack of physical exercise, leads to morbidity-inducing conditions and consequent increase in mortality rates (Danaei et al., 2009). In addition, the recent COVID-19 pandemic has contributed to inflame such a situation due to the imposed lockdowns (Kaur et al., 2020; Robinson et al., 2021). That is why establishing more cost-effective interventions to maintain the muscle mass quality and function should be one of the main government challenges. Mobility and physical independence is determined by physical fitness (i.e. on the quality of muscle mass) (Garatachea et al., 2015). The importance of muscle mass and strength in physical performance, as well as in daily activities has never been questioned. However, its vital role in the genesis of many common chronic diseases and conditions including aging is often ignored and generally as many do not appreciate what this actually represents for overall health. Current healthcare systems rarely evaluate muscle mass function or strength (Srikanthan and Karlamangla, 2014).

Notwithstanding, the importance of physical exercise implementation as an additional prescription to combat morbidity-inducing conditions such as hypertension, diabetes and depression is constantly gathering further attention (Micallef, 2014a, 2014b). In addition, early-age inception of a pro-physical health mindset in schools can enhance the development of future generations, having increased awareness on how to attain physical and mental wellbeing through consistent physical activity across adulthood (Micallef et al., 2010).

Unfortunately, despite such awareness, such implementations within individual lifestyles (including exercise-prescribing) fail to be sustained on a long-term basis. Such issues exist since, in the general population mindset, the appropriate physical exercise regimes required to achieve well-being, weight loss and/or increase muscle mass and stamina generally revolve around the concept that such regimes are highly time consuming and focus mainly on cardiovascular activities. Most individuals' aversion towards consistent physical exercise can be narrowed to three main issues, namely a perceived lack of time availability to invest in physical exercise, lack of swift and tangible positive outcomes following physical exercise and a consequent lack in motivation to continue physical exercise regimes (Sluijs et al., 1993).

Consequently, the effectiveness of prescribing physical exercise regimes to the individual patient can be considered as possibly futile, unless such a prescription is integrated with methodologies that can constantly register and monitor patient compliance (vis a vis physical exercise), training intensities, documentation and specific bio/markers, together with iterative modifications to ensure maximized effectiveness for the patient through a truly bespoke physical exercise program compliance.

Thanks to modern technology, there is an opportunity to improve self-efficacy within the design of health solutions. Methods that include biofeedback, interactive games, competitions, videos and self-monitoring, similar to that used in commercially available fitness trackers, have the potential to improve the self-efficacy and ultimately the adherence of users (Argent et al., 2018), though the ultimate challenge remains the maintenance of individual motivation to continue such time-consuming physical exercise programs.

There has been a recent trend development in other forms of physical activity programs that are less time-consuming and do provide rapid benefits in those individuals that choose to comply fully to such regimes. Such revolutionary regimes include high intensity interval training (HIIT) and isometrics training programs, can actually lead into a paradigm shift concerning recommended physical exercise strategies that can be consistently sustained throughout an individual's lifetime. Such techniques are becoming ever-more attractive since combined HIIT and isometric training programs only require two weekly training sessions of a maximum

of 10 minutes / session, compared to the typical 30 minutes of daily recommended cardiovascular-based physical activity, with such novel and concise exercise regimes providing comparatively swift results within weeks of adoption by the individual (Pérez-Turpin et al., 2019).

In addition, it is important to emphasize that both HIIT and isometric training programs are based upon muscle mass modulation for their effectiveness and can actually provide further benefits compared to currently mass-recommended cardiovascular activity-based exercise regimes (Cuddy et al., 2019; Petrofsky, Batt, et al., 2007, 2006). This is due to the fact that muscle mass plays a pivotal part in the body's metabolism due to it being the main source of amino acids for healthy levels of protein synthesis in essential organs and tissue types (Wolfe, 2006).

In addition, this review article serves to shed more light on muscle-mass-modulation training techniques and also describes routes through which a defined through a combined HIIT and isometrics-based training program, can incept important changes within individual mindsets regarding the minimum effective amount of time investment is required for attaining and maintaining physical well-being.

THE IMPORTANCE OF FUNCTIONAL MUSCLE MASS

Skeletal muscle is the most abundant tissue in non-obese adults, accounting for up to 50% of total body weight in a healthy, athletic individual (Janssen et al., 2000). Skeletal muscle also plays a central role in whole-body metabolism, including the maintenance of protein synthesis (Wolfe, 2006), contribution to proper glucose and lipid metabolism (Jeukendrup et al., 1998) and acting as a major determinant of basal metabolic rate (Konopka et al., 2014; McNab, 2019; Vásquez-Alvarez et al., 2021) – thus rendering contractile muscle as the most active metabolic tissue within higher-order organisms, including humans.

Furthermore, deficient muscle metabolism plays a key role in the aetiology of many common pathologic conditions and chronic diseases (Wolfe, 2006), having a clear relationship between higher levels of muscle mass with improved life expectancy and longevity (McNab, 2019; Vásquez-Alvarez et al., 2021; Wolfe, 2006). The past decade has also been decisive for the identification and in-depth research efforts on the prospects of skeletal muscle acting as an endocrine organ, through the release of myokines that have a myriad of autocrine / paracrine influences, consequently shedding more light on communication / interplays between skeletal muscle and other vital organs (Fiuza-Luces et al., 2013; Pin et al., 2021a). Skeletal muscle mass - through physical exercise-driven myokine release - can also be key mechanistic players for influencing metabolism, anti-inflammatory and adaptive effects (Ahima and Park, 2015; Gonzalez-Gil and Elizondo-Montemayor, 2020; Nimmo et al., 2013; Pin et al., 2021b), as well as resistance to stress and disease (Anker and Coats, 1999; Biolo et al., 2002; Sugden and Fuller, 1991) and cognitive improvement (van Praag, 2009).

Through a physiological perspective, the maintenance of skeletal muscle mass is of obvious and vital importance for sustaining essential and continuous processes such as ventilation, cardiac output and circulatory function, efficient peristalsis within the gastro-intestinal tract and locomotive force for providing mobility, among other pivotal roles. Consequently, the development and strengthening (hypertrophy) of muscle mass, together with atrophy prevention, is of paramount importance for the attainment and maintenance of a healthy body.

THE DANGERS OF LOW MUSCLE MASS

Following from the above descriptions, given its central role in human mobility and metabolic function, any deterioration in the contractile, material and metabolic properties of skeletal muscle has an extremely important effect on human health (Sakuma and Yamaguchi, 2012), playing a key role in the prophylaxis and attenuation of a myriad of common chronic diseases, such as obesity, type 2 diabetes, hypertension, metabolic syndrome, cardiovascular diseases, osteoarticular diseases, chronic kidney and non-alcoholic fatty liver disease and cancer (Harrison and Leinwand, 2008; Jang et al., 2021; Kim et al., 2018, 2021; Lee et al., 2021; Low et al., 2021; Muchai Manyara et al., 2021; Rupert et al., 2021). In all such cases, muscle mass hypertrophy was found to be beneficial for disease prophylaxis and/or disease regulation.

Dramatically and unfortunately, the average muscle mass in adults is decreasing due to unhealthy lifestyle patterns, which combine an inflammatory and high-glycaemic diet pattern (GBD 2017 Diet Collaborators, 2019; Spreadbury, 2012) with a decrease in the level of intensity and volume of daily physical activity (Booth and Roberts, 2008; Owen et al., 2010), causing a deterioration of muscle mass and therefore a detriment to health and productivity. Due to this, annual global cases of a myriad of morbidity and mortality-inducing conditions are on the rise, leading to decreased quality of life and increased functional limitations, ultimately placing additional burdens on social and healthcare budgets.

MUSCLE MASS HYPERTROPHY LEADS TO INCREASED LONGEVITY

There is a clear relationship between the levels of muscle mass and a better life expectancy and longevity (Hettinger et al., 2021; Srikanthan and Karlamangla, 2014; Yerrakalva et al., 2015). Muscle mass is regarded as an excellent indicator of physical well-being as typically, since chronic disease conditions such as cancer and cardiac failure can lead to severe depletion of muscle mass, together with reduction in physical strength and metabolic activity (Wolfe, 2006). This muscle wasting condition is known as cachexia (Wolfe, 2006). Other essential conditions whereby increased muscle mass and contractility properties play pivotal beneficial roles include regulation of sarcopenia, obesity, insulin resistance, diabetes and osteoporosis (Wolfe, 2006; McCormick and Vasilaki, 2018). Consequently, one can infer that the status of muscle mass within an individual and/or patient can extrapolate to the actual health condition within the individual and, in addition, enhance assertions for life expectancy. Unfortunately, recent research revealed that overall youth muscle strength parameters are in decline. The study carried out by Hollmann and Schifferdecker-Hoch focused on a comparative analysis of readouts for grip and lateral pinch potential in millennials (20 – 34 years old) and equivalent mid-1980s youth datasets (Hollmann and Schifferdecker-Hoch, 2017). The results of this investigation highlighted that millennials' mean grip readouts were decreased, with only a mean grip-weight of 20% in men and 14% in women (Hollmann and Schifferdecker-Hoch, 2017).

Despite the above statistics, any individual who makes the solid commitment to improve their general well-being and overall health status through consistent physical exercise programs, can fruitfully benefit from such a lifestyle choice. A recent long-term study (19 years), carried out by Florido and colleagues, focused on monitoring 11,351 patients participating in the Atherosclerosis Risk in Communities (ARIC) study for heart failure events (Florido et al., 2018). This study revealed that all participant groups who complied with the minimum recommended physical activity programs consistently, had a lower incidence of heart failure events (Florido et al., 2018). This trend was also identified within participant cohorts that commenced / intensified their level of physical activity in late middle-age (55+), consequently providing further evidence for the beneficial effects of physical activity in circumventing heart failure event onset (Florido et al., 2018). Furthermore, one of the UK Biobank studies recently carried out on a cohort of 476,559 individual participants

(together with an additional 1162 schizophrenia patients) demonstrated that handgrip strength was intimately related to cognitive function, especially regarding processing rapidity and functional memory capacities (Firth et al., 2018). Such a large-scale study finding certainly provides further evidence to validate the importance and utility of increased muscle mass and strength, at any age bracket, in mitigating against physical and mental morbidity-inducing conditions.

MUSCLE MASS QUALITY EXPRESSED THROUGH STRENGTH TESTING

The study conducted by Newman and colleagues in 2006, serves to provide more data revealing the main importance of muscle strength, rather than muscle mass, which is directly related to patient health status and metabolic age (Newman et al., 2006). In brief, this study analysed mortality prevalence among a cohort of 2292 heptagenarian participants. Physical functions such as knee extension strength and grip strength were recorded, together with thigh muscle area and limb soft tissue mass values being recorded (Newman et al., 2006). The study results concluded that reduced muscle mass could not account for the robust interplays between strength and mortality, rendering muscle strength and quality the most essential factor (rather than muscle mass) for calculating mortality risks (Newman et al., 2006). Similar results were recognized by the study performed by Ma and colleagues in 2018 on Chinese osteoporosis patients (Ma et al., 2018). In this particular investigation, over 1100 elderly individuals (> 60 years of age) were treated to a generalized health status check that included calcaneal measurements as a means of identifying possible osteoporosis. In addition, skeletal muscle mass and strength were measured through grip strength and appendicular skeletal muscle mass assessments (Ma et al., 2018). The results of this investigation elucidated that muscle strength is the main parameter that is negatively related to osteoporosis in geriatric patients.

HIGH INTENSITY INTERVAL TRAINING (HIIT)

The practicing of HIIT essentially involves reduced time periods of severely intense cardiovascular activity that typically led to anaerobic conditions within the implicated muscle groups, bridged by rest intervals in order to allow body recovery from any oxygen debts (Laursen and Jenkins, 2002). The main scope of such highly intensive, though short-lasting, physical activity is for increasing overall athletic capacity and also to maximize glucose metabolic processing activities (Laursen and Jenkins, 2002). In addition, HIIT proved to be highly effective, compared to traditional cardiovascular activity, for reducing adiposity in volunteer cohorts (Tremblay et al., 1994). The study carried out by Tremblay and colleagues evaluated, among other factors, loss of adiposity in two volunteer cohorts – one assigned a 20-week endurance training and another cohort assigned a 15-week HIIT training program (Tremblay et al., 1994). The study results demonstrated that overall loss of adipose tissue within the HIIT cohort was nine-fold higher compared to the endurance-training cohort (Tremblay et al., 1994). In essence, HIIT is highly effective on multiple levels - with drastically reduced workout periods – since oxygen consumption is highly increased (leading to a burst in caloric expenditure), inducing a triggering effect on individual metabolic rate to remain elevated for hours post-workout due to excess post-exercise oxygen consumption (EPOC), increased adipose tissue expenditure for restoring homeostatic metabolic rate, increased effectiveness in lactic acid removal and – most importantly – lead to up-regulation of human growth hormone, testosterone and insulin-like growth factor-1 for rapid repair of skeletal muscle proteins and ultimately enhancing muscle mass and strength accordingly ("*7 Reasons HIIT is So Effective*", 2020; Ben-Zeev and Okun, 2021).

It must also be emphasized that, due to the intense demand for protein synthesis placed upon the body during individual HIIT sessions, such a physical exercise program should always be integrated with a bespoke high-protein diet (Layman et al., 2015; Wu, 2016) in order to achieve optimal results during HIIT workout

sessions, thus ensuring maximum increases in skeletal muscle mass and strength for the individual participant.

ISOMETRIC STRENGTH TRAINING

The first mentioning of isometric evaluation from muscle excitation studies was the investigation carried out by Dean at the turn of the last century (Dean, 1901). The concept of isometrics training essentially consists of static muscular contraction-based exercise regimes (Mitchell and Wildenthal, 1974). The review by Mitchell and Wildenthal describes dynamic physical exercise as leading to length alterations in the utilized muscles groups, with no change in muscular tension, primarily involving cardiovascular-based activities such as running, cycling or swimming (Mitchell and Wildenthal, 1974). Conversely, isometric physical exercise leads to alterations solely within muscle tension, with minute or no alteration in muscle length, primarily involving resistance-based activities such as lifting / pushing weight-loads or muscular contractions against fixed objects (Mitchell and Wildenthal, 1974). Later studies also highlighted that isometric-based physical activities led to much higher strength development, when compared to equivalent dynamic activity-based physical exercises (Jones and Rutherford, 1987). The study conducted by Jones and Rutherford established that following a 12-week isometrics training program, there were marked increases in isometric forces generated per fixed-cross-sectional area by the involved muscle groups (11-15 %) (Jones and Rutherford, 1987). In addition, this seminal study also highlighted that eccentric (muscle stretch-based) isometric training led to a 45% increase in isometric strength gain when compared to concentric (muscle shortening-based) isometric training programs (Jones and Rutherford, 1987). These observations suggest that the larger increase in forces, seen as a result of isometric training, can be explained by the greater degree and duration of muscle activation, when compared to dynamic training (Jones and Rutherford, 1987).

Interestingly, the series of experiments conducted by Hettinger and Muller led to a number of important findings (Hettinger et al., 2017; Hettinger and Muller, 1953), namely:

- a) A training stimulus of approximately 20 % of the maximum force (F_{max}) led to muscle atrophy, while a stimulus of approximately 45% F_{max} led to a weekly increase in isometric strength by approximately 5%.
- b) A training stimulus with a minimum duration of two seconds at maximum isometric contraction (MIC) – or 4 – 6 seconds at 40% MIC level - was sufficient for providing isometric strength gains.
- c) Only one daily training stimulus was required for attaining maximum isometric strength increase. Increasing to a daily frequency of up to 7 training stimuli served no additional isometric strength gains.

Apart from rapid and consistent isometric muscle mass strength gains, isometric exercise training programs prove to be of major benefit in mitigating against multiple morbidity-inducing medical conditions.

Interestingly, the study performed by Petrofsky and colleagues in 2006 focused on the effect of concomitant contraction of both agonist and antagonist muscle groups as a form of isometric strength training (Petrofsky, Batt, et al., 2006). The study involved 17 participants that were encouraged to perform both isometric exercise through muscular co-contractions, together with conventional weightlifting-based exercises for three body areas (arm, trunk, leg muscle groups). The study results revealed that isometric co-contraction of muscle groups provided a five-fold increment in training outcomes (weight mass / strength gain) in comparison to conventional muscle training exercise regimes (Petrofsky, Batt, et al., 2006). Following from this study, the Petrofsky group also performed a secondary investigation focusing on the effectiveness of implementing

such isometric exercise programs together with a monitored dietary program and was found to be highly successful in achieving both weight loss and muscle gain outcomes (Petrofsky, Batt, et al., 2007).

Previous studies on multiple hypertensive patient cohorts that underwent dynamic or isometric physical training routines revealed that those patient cohorts opted into the isometric training regime experienced a more effective and sustained reduction in systolic and diastolic blood pressure levels accordingly (Fiuza-Luces et al., 2013). Furthermore, a separate, 12-year study conducted by Grøntved and colleagues in 2015 focused on the possible correlations for isometric muscles strength and cardiovascular risk factors within 332 youth study-participants, that were monitored until young adulthood (Grøntved et al., 2015). Isometric back extension / abdominal flexion exercises were registered through a strain-gauge dynamometer (typical instrument utilized for measuring isometric exercise force exertions), while cardiorespiratory status was recorded through maximum cycle ergometer analyses (Grøntved et al., 2015). The results of this long-term, large-scale study revealed that augmented isometric muscle strength within youth is intimately related to a reduction in cardiovascular risk factors once such individuals entered young adulthood, with this relationship being independent of individual fitness levels, degree of adipose tissue presence or other interfering issues (Grøntved et al., 2015). In addition, nearly all individuals from this 12-year study (n = 217) were also monitored for the possible interplays between isometric exercise routine adoption and long-term glucose metabolism parameters (Grøntved et al., 2013). Following identical isometric exercise regimes performed in the previously above-described study (Grøntved et al., 2015), insulin resistance and β -cell function assessments were performed through the monitored analyses of fasting serum insulin levels and glucose for the entire 12-year study period (Grøntved et al., 2013). The results for this parallel long-term investigation demonstrated that the consistent adoption of isometric exercise routines in youths, increased isometric muscle strength levels were inversely linked to fasting insulin levels and insulin resistance, suggesting that embracing such physical activity can mitigate against diabetes Type II development in adulthood (Grøntved et al., 2013).

Additional benefits of isometric exercise training routines include amelioration of condition in atrophied muscle groups (Friedebold et al., 1959; Friedebold and Stoboy, 1968) and was also found to provide equivalent / enhanced positive outcomes within individuals practicing isometric exercise routines, in comparison to conventional, cardiovascular-based dynamic exercise regimes (Burgess et al., 2007). Such study results also demonstrated isometric exercise routines to be less stressful on the individual's body, while also achieving elevated positive outcomes following minimal time investments by the individual (Burgess et al., 2007).

Interestingly, the study carried out by Schnohr and colleagues on approximately 5000 individuals (1098 joggers / 2950 healthy non-joggers), discovered that over-strenuous / over-frequent jogging routines actually proved to be detrimental and contributing to increase in all-cause mortality, thus suggesting that the ideal physical training program should be brief, intensive and infrequent (Schnohr et al., 2015).

HYBRID HIIT/ISOMETRICS STRENGTH TRAINING PROGRAMS: THE CYFIT SMARTGYM SOLUTION

The exercise-induced adaptation of the skeletal muscle during conventional endurance and resistance training has been demonstrated in multiple studies (Miyamoto-Mikami et al., 2018). Furthermore, studies that compare high-intensity aerobic interval (HIIT), resistance training (RT), and combined have shown that all of the training types enhanced insulin sensitivity and lean mass, but only HIIT and combined training improved aerobic capacity and skeletal muscle mitochondrial respiration and reversed transcriptional signature of aging (Robinson et al., 2017).

Following analyses of the considerable advantages and rapid results of both isometric and HIIT training programs the authors have developed the Cyfit Smartgym as a potential tool to increase overall strength levels, physical performance to all users and prevent or attenuate specific morbidity-inducing disease conditions.

The Cyfit Smartgym serves as a prototype isometric and HIIT training program and progress monitoring mobile package. The unit is portable, permits screening, training, documentation and supervision. The software can deliver tangible results with 10 minutes training sessions. Implementation of the Cyfit program, together with a biological adapted diet can lead to concrete positive outcomes, including weight loss. The Cyfit Smartgym can be linked to a cell phone application and measures real-time force production, total force production and additionally provides data on intensity, triangulated goals and progress reports. The complementing software package also employs a game-based technology with competitive elements in order to overcome the participants' three greatest challenges to exercise: lack of time, lack of tangible results and progress and motivational issues. The Cyfit Smartgym is linked to a body-fat scale and smartwatch, allowing it to perform as a comprehensive and independent health system that can be monitored remotely by health and fitness professionals typically coaching the participant. In addition, there is some evidence that wearable devices can improve long-term physical activity and weight loss outcomes (Fawcett et al., 2020).

This novel prototype for introducing hybrid isometric and HIIT training programs to mainstream markets provides proof-of-concept for the employment and regulation of physical activity. Together with associated and relevant datasets, the Cyfit Smartgym can reveal evolutions (or regressions) in physical status, consequently conveying awareness to the health professional to initiate medical interventions when necessary.

Since, as described above, overall strength levels can be utilized as a phenotypic biomarker for assessing generalized health and life expectancy, the Cyfit Smartgym was designed to determine isometric-training-derived strength levels as a means of calculating "*biological age*" of the individual participant, together with a "*life expectancy*", based on such readout datasets, post-training sessions.

Presently, a handgrip dynamometer (non-motorized dynamometry) is employed for measuring isometric exercise session parameters, though this focuses solely on the wrist flexor muscle group (Hurley, 1995; Barbat-Artigas et al., 2012). Consequently, the Cyfit Smartgym caters for such an issue through the development of a novel dynamometer that can register the activity of up to five separate muscle groups within a five-minute exercise session.

A detailed study carried out by the University of Alicante (Pérez-Turpin et al., 2019) render the Cyfit Smartgym to be clinically validated to provide accurate and rapid assessment of individual health status (through determination of isometric strength capacity) and life expectancy.

This study protocol was designed according to a previous similar study conducted by Guerra and colleagues (Guerra et al., 2017) and one of the conclusions stated that the use of the Cyfit-based dynamometer offered increased advantages over conventional handgrip dynamometers since it measures multiple muscle groups, thus leading to a more comprehensive and thorough assessment for isometric strength and consequent general health status determination within the individual.

Thus allowing the health professional to have more complete data and foresight when clinically managing patients.

One further advantage brought by the Cyfit Smartgym training package is that it provides motivational-oriented audio-visual feedback with challenging and competitive games, encouraging the user to train more intensely. Although there presently are many applications that use games to increase physical activity, there has not been any such applications focusing to create measurable high-intensive strength training, designed to improve muscle development. Having real time training intensity goals can improve training results in a way difficult to reproduce. In addition, the utilization of full-screen Smart graphs depicting multiple parameters (both health status-directed and current training session-directed) further enhance motivational mindset within the individual user for self-analysis and self-development for his/her strength training journey.



Figure 1. Training with CYFIT.

CONCLUSIONS AND PERSPECTIVES

In essence, the Cyfit Smartgym represents a novel and functional approach to hybrid HIIT/isometric-based training programs, that are very well proven to provide the much-desired paradigm shift from cardiovascular-based dynamic training programs. Advantages for such a shift include the possibility of users with time-scheduling challenges being able to embrace such reduced training sessions and timeframe session. In addition, isometric exercise regimes have demonstrated to provide additional muscle mass and overall strength gains, adipose tissue loss within the user, in comparison to conventional dynamic training programs. Furthermore, considering the fact that such training sessions are totally gamified leads to more enjoyable experience. It is also important to mention that the Cyfit Smartgym was recently adopted for a study with analogue astronauts for use in Lunar and Marth missions, analysing effectiveness to combat zero-gravity-induced muscle atrophy in astronauts as well as age and or sedentary lifestyle related atrophy on Earth. Future technologies could possibly provide ameliorations to the current manner by which were taught to practice physical education, though at this point in time, hybrid HIIT/isometric training platforms such as the Cyfit Smartgym can provide the answers already, bringing a paradigm shift to our approach and mindset towards physical exercise, with more accurate and reliable ways for monitoring general health and life expectancy to all.

AUTHOR CONTRIBUTIONS

L.W. and G.R.G. manuscript writing. All authors contributed to data organization, management, and analyses along with the writing of the final manuscript.

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No potential conflict of interest was reported by the authors.

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