Feasibility and Health Impacts of High-Intensity Functional Training for Adults with Mobility Disabilities

Lyndsie Koon
lyndsiek@ku.edu

The University of Kansas - Lawrence Campus: The University of Kansas https://orcid.org/0000-0002-4362-1398

Joseph Donnelly
University of Kansas Medical Center

Richard Washburn
University of Kansas Medical Center

Joseph Sherman
University of Kansas Medical Center

Magdelyn Kroeger
University of Kansas Medical Center

Rebecca Swinburne Romine
The University of Kansas - Lawrence Campus: The University of Kansas

Reed Handlery
Arkansas Colleges of Health Education

Kaci Handlery
Arkansas Colleges of Health Education

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Abstract

Purpose: This study evaluated the feasibility and initial effects of a 12-week high-intensity functional training (HIFT) intervention for adults with mobility disabilities.

Design and Sample: A single-group, pre-post design with assessments at baseline and post-intervention. Twelve participants (75% female; 37-74 years) with mobility disabilities

Intervention: Twelve-week, thrice weekly community-based HIFT program

Measures: Feasibility was assessed via recruitment, retention, and adherence. The Canadian Occupational Performance Measure (COPM) evaluated functional health, while work capacity, flexibility and weight assessed physical outcomes. Psychosocial measures included the WHO-QOL Abbreviated Questionnaire, Self-Rated Abilities for Health Practices and Barriers to Health Adapted for People with Disabilities scale. Energy expenditure via portable indirect calorimetry, and exit interviews captured participant experiences.

Analysis: Feasibility was reported as percentages; descriptive statistics and effect sizes were calculated for functional, physical, and psychosocial outcomes. Thematic analysis identified themes from transcriptions.

Results: Recruitment was 51%, retention 83%, and attendance 77.5%, with one adverse event. Improvements were observed in function (d=0.93-1.04), fitness (d=0.65-1.59), flexibility (d=0.36-0.64), BMI (d=0.32), quality of life (d=1.04), self-efficacy (d=1.03), and barriers to health behavior (d=0.48). Participants reported high satisfaction and community support. Energy expenditure averaged 154.65 (±65.5) kcals/session and 86.13 (±42) kcals during exercise.

Conclusion: A community-based HIFT program for individuals with mobility disabilities is feasible, however, the small sample size limits the ability to attribute changes to the intervention.

ClinicalTrials.gov: HIFT for People with Mobility-Related Disabilities (Research GO); NCT05516030.

Key messages regarding feasibility

Uncertainties regarding feasibility: It was unknown whether adults with diverse mobility disabilities could be safely and consistently engaged in a HIFT program delivered in community-based gym settings by certified trainers. Additionally, there was uncertainty regarding recruitment, retention, and adherence to a thrice weekly, 12-week intervention.

Key feasibility findings: The study achieved a 51% recruitment rate, 83% retention, and 77.5% session attendance, with only one non-injurious adverse event. Participants reported high satisfaction with trainer support, adaptive programming, and peer engagement, suggesting the intervention was acceptable and safe for this population.

Implications for the design of the main study: Findings support the feasibility of a larger randomized controlled trial. Future study design should retain the community-based delivery model, incorporate flexible session scheduling to improve attendance, and explore the use of alternative intensity measurement tools. These refinements will strengthen the scalability and real-world applicability of HIFT for people with mobility disabilities.

BACKGROUND

Mobility disabilities affect over 70 million U.S. adults, with those affected being three times more likely to experience chronic conditions (e.g., heart disease, diabetes, obesity, chronic pain) and difficulty with daily activities compared to those without disabilities [1]. These disparities stem from limited access to health promotion services and physical inactivity [2, 3]. Although exercise improves functional (e.g., strength), physical (e.g., weight management), and psychosocial (e.g., increased community participation) health [4–7], less than 40% of adults with mobility disabilities meet exercise guidelines compared to 54.1% of adults without disabilities [8–10].

Healthcare professionals often lack knowledge on prescribing or referring clients to accessible exercise programs[11, 12]. Outpatient therapy is typically short-term and retroactively prescribed due to injury/illness[13]. Most exercise interventions (84%) for people with disabilities occur in clinical settings, limiting their implementation in the community[4, 14]. Barriers to community-based exercise include personal (e.g., lack of motivation), environmental (e.g., inaccessible equipment) and contextual (e.g., lack of certified/experienced trainers) challenges [15–20]. To translate research into practice, it is crucial to establish feasibility and effectiveness outside clinical settings. More community-based studies are needed to address participation barriers and inform exercise recommendations beyond traditional rehabilitation[21, 22].

High-intensity functional training (HIFT) offers a community- and group-based, scalable model emphasizing functional movements. Ranked among the top 10 most popular exercise modes for the past decade[23], HIFT utilizes multiple modalities to simultaneously place demand on aerobic and anaerobic based systems [24, 25], making it a potentially more efficient form of exercise than traditional training [26, 27]. The functional movements serve as the basis for activities of daily living [28] and support activities specific to people with mobility disabilities such as transferring or ambulation. Moreover, improving functional health has been found to reduce fatigue and reliance on assistive devices, promote participation in daily activities, and increase community engagement for people with mobility disabilities [4, 6].

HIFT research primarily focuses on non-disabled populations, showing improvements in aerobic capacity, strength, endurance, and body composition[29–31], alongside positive psychological outcomes such as social support, enjoyment, and self-determined motivation[24, 26, 32, 33]. Qualitative findings from 38 individuals with disabilities provide preliminary evidence supporting the benefits of HIFT participation for health and psychosocial gains such as increased confidence, reduced anxiety, and a sense of community[34]. Two single-arm 25-week pilot studies demonstrated initial feasibility of HIFT, but findings are limited to specific disability groups: spinal cord injury (SCI)[35] and Parkinson's disease[36] and the interventions were designed and implemented under the direction of physical therapists. These limitations highlight the need for broader research on HIFT for mobility disabilities in community settings with certified trainers. This study assessed feasibility via recruitment, adherence, retention, and participant feedback from exit interviews[37] as well as initial effects on functional, physical, and psychosocial health outcomes of a 12-week community-based HIFT intervention for adults with various types of mobility disabilities.

METHODS

Design

We utilized a single-group design with outcome assessments conducted at baseline and after the 12-week HIFT intervention. The intervention took place within an existing adaptive HIFT program at three different facilities, with a primary trainer programming the sessions across sites. Rolling enrollment was used where participants began the study at any timepoint at their chosen location. Institutional review board approval was obtained from the primary author's institution, and the trial was registered on ClinicalTrials.gov (NCT05516030). Participants provided written informed consent prior to data collection.

Sample

Eligible participants were 18 years of age or older, self-identified as having a permanent mobility disability for no less than one year (defined as having serious difficulty walking or climbing stairs, or lifting/carrying an object, such as a gallon of water) confirmed by their physician, had no prior HIFT experience, and could communicate and read in English. Interested individuals completed an online eligibility survey or were directly contacted by study staff and screened for eligibility by telephone. Recruitment was conducted through local disability service providers, healthcare providers including physician offices, rehabilitation clinics, seating clinics, social media, and word-of-mouth between September, 2023 to June 2024. Participants were compensated $100 in total, including $30 each for baseline and post-intervention surveys (online) and assessments (in-person at HIFT facility), and $40 for completing exit interviews via teleconferencing platform.

Measures

Demographic and feasibility outcomes. Demographic data (e.g., gender, age, race/ethnicity) were collected via a pre-intervention survey from all consented participants. Recruitment rates as the proportion of eligible individuals who provided informed consent, while retention rates reflected the percentage completing the 12-week intervention and post-testing. Adverse events (e.g., falls, pain) were recorded regardless of whether they occurred during or outside HIFT sessions. Semi-structured qualitative interviews, conducted via phone or Zoom™ within 10 days post-intervention, explored participants' perceptions, trainer satisfaction, adaptive program elements, adherence challenges, and perceived health impacts[38]. Prompts were used to encourage more in-depth responses and gain clarity on participant reflections.

Functional outcomes. The Canadian Occupational Performance Measure (COPM)[39] assessed self-perceived function. Participants identified up to five important daily activities across self-care, productivity, and leisure and rated performance and satisfaction on a 10-point scale (1 = cannot perform at all; 10 = perform extremely well). The COPM has demonstrated good test-retest reliability (intraclass correlation coefficients >0.80) in rehabilitation settings [40] and has shown responsiveness to change in clinical populations [41, 42].

Physical and anthropometric outcomes. Fitness was assessed via standardized work capacity tests[43], defined as an individual's ability to complete mechanical work across differing modalities, intensities, and time domains [24, 44]. The first session involved alternating rowing and plate ground-to-overhead (G2OH) movements, with the final score as the sum of G2OH repetitions and rowing calories. The second session consisted of biking, shoulder presses, and weighted slam balls or box squats, with completion time as the outcome. Seated and standing adaptations were recorded for consistency. Testing occurred pre- and post-intervention, led by the primary HIFT trainer (see Table 2).

[INSERT TABLE 2 HERE]

Handgrip strength was assessed using a Jamar® Smart Digital hand dynamometer (Patterson Medical, Warrenville, IL). Ambulatory participants stood with feet shoulder-width apart, while non-ambulatory participants sat upright. Three trials were conducted per hand, with approximately 30 seconds of rest between each attempt. The scores (in kilograms) were averaged to obtain a final dominant and non-dominant grip strength score. Upper body flexibility was measured using the back scratch test [45], a reliable (ICCs: 0.96, 95 % CI: 0.94 to 0.98) and valid assessment of overall shoulder range of motion in older adults [46]. Participants reached one hand behind their head and the other behind the back, attempting to touch the middle fingers together. The outcome was the average distance (in inches, to the nearest half inch) between (negative score) or overlap (positive score) of the middle fingers from two trials with both the dominant and non-dominant arms reaching behind the head. For ambulatory participants, weight was measured in duplicate on a calibrated scale (Model #PS6600, Belfour, Saukville, WI) and converted to kilograms. Non-ambulatory participants self-reported weight due to lack of a wheelchair scale. Height was measured using a stadiometer (Model #IP0955, Invicta Plastics Limited, Leicester, UK) for ambulatory participants, while tibial height was used for non-ambulatory participants[47, 48]. Body mass index(BMI) was then calculated as participant weight in kilograms divided by height in meters squared (weight (kg) / [height (m)]²).

Psychosocial Outcomes. Quality of life was assessed using the World Health Organization's Quality of Life Abbreviated Questionnaire (WHOQOL-BREF) [49]. This 26-item survey evaluates physical, psychological, social, and environmental health, and has been validated as a reliable quality-of-life measure across various clinical populations, including people with disabilities [50].

Self-efficacy was measured with the 28-item Self-Rated Abilities for Health Practices (SRAHP) scale [51], which provides a total self-efficacy score for health practices comprised of four subscales assessing exercise, nutrition, and psychological well-being. The SRAHP has demonstrated high internal consistency and reliability (α = .94) among individuals with disabilities [51, 52]. The Barriers to Health Adapted for People with Disabilities (BHADP) scale [53] evaluated changes in perceived barriers to exercise. This 16-item scale asked participants to rate how frequently health issues posed challenges to daily activity engagement, and has shown high internal consistency (α = .82) among individuals with disabilities [53].

Energy expenditure. Exercise intensity was assessed by trained research staff using a previously validated portable, open-circuit indirect calorimeter (COSMED - K5, COSMED Italy) that measures breath-by-breath ventilation, expired oxygen, and carbon dioxide. After a minimum of a 45-minute warm-up, the calorimeter was calibrated with room air and known gases, and the flow turbine was calibrated using a 3.00- Liter syringe. Immediately before the session, the participant breathed into a face mask that directed air into the unit housing the O_2 and CO_2 gas analyzers set to collect in breath-by-breath mode. The lightweight (~1.0 kg) portable system was worn via harness or attached to wheelchairs and remained on for the duration of the session. The time of day and system run time were recorded to the nearest second at the start and end of each session. A member of the study team was present for the entire session to ensure the safety and correct use of the device. Additionally, staff recorded start and stop time of the various portions of the sessions, including warm-up, skill practice, WOD, cooldown, and any non-programmed rest. Participants were randomly selected for testing during a single session approximately halfway through the intervention, and the data collection was entirely optional.

Procedures. Following eligibility screening, physician clearance, and informed consent, baseline surveys were administered online via REDCap [54]. A trained research team member scheduled and completed the COPM by phone. During onboarding sessions (described below) a research team member collected baseline anthropometric (i.e., weight, BMI) and physical (i.e., grip strength, flexibility) measurements. Participants then attended the facility on two additional occasions to complete the initial work capacity tests with the primary HIFT trainer. After completing the intervention, participants repeated the two work capacity tests with the primary trainer, and a research assistant conducted the final assessments. Exit interviews were conducted within ten days of intervention completion along with post-intervention surveys.

Intervention

Onboarding.Participants completed two onboarding sessions at their preferred HIFT facility, where the primary HIFT trainer assessed movement limitations and instructed on fundamental movements (e.g., press, squat) before progressing to monostructural movements (e.g., rowing, cycling, pushing). These sessions (~45 minutes) provided participants with the opportunity to learn basic HIFT movements in a controlled setting before beginning the full intervention.

Intervention sites. This study partnered with a community-based adaptive HIFT program. The intervention took place within three facilities in the greater Kansas City area where each location offered five classes per week, allowing participants to attend three sessions per week at the location of their choice. Participants had the option to attend additional sessions to compensate for any missed ones. All sites featured accessible amenities and were equipped with full training rigs (i.e., multifunctional structure), rowing machines, air-dyne bikes, ski ergometers, free weights, medicine balls, resistance bands, plyo boxes, kettlebells, barbells, and bumper plates. Adaptive equipment included split ropes, wide ski erg bases with lower-set handles, and adjustable handles and consoles for bikes.

Trainers. The head trainer, a CrossFit Level 3 and an Adaptive and Inclusive Trainer (AIT) certified coach with 10+ years of experience designed the intervention—including customized adaptations for all participants—and supervised work capacity testing. Each intervention site had at least two AIT-certified trainers, supported by student volunteers and where applicable, care partners. Sessions maintained a 1:5 trainer-to-participant ratio.

Sessions. Sixty-minute sessions were offered five days per week and included an overview of the session, exercise demonstrations, including adaptations, and addressed participant questions or health-related concerns. Each session also included a 10–15-minute warm-up consisting of mobility, aerobic, and/or strength training; the Workout of the Day (WOD; 10-25 minutes); and a 10-minute cool-down where participants reported their performance outcome (i.e., time, rounds + repetitions). WOD formats included As Many Rounds as Possible (AMRAP); Rounds for Time (RFT); and Every Minute on the Minute (EMOM) where the participant repeated a series of 1-minute bouts of different activities (see Table 1).

[INSERT TABLE 1]

Session adaptations. HIFT sessions followed the Adaptive Training Academy's guidelines, ensuring that modifications preserved the sessions intended stimulus while accounting for individual impairments[55]. Adaptations supported seated or standing participants, with further scaling based on movement limitations or assistive device use. Some participants progressed from seated to standing as confidence, balance, and strength improved.

Participant safety. Safety was prioritized through individualized adjustments to movement, load, repetitions, and rest periods. Each participant had a designated workout space with fall-prevention measures (e.g., handrails, soft edges, secure seating with straps). Trainers monitored participants throughout sessions, modifying movements as needed to prevent injury. Cooldowns incorporated breathing exercises, hydration, and stretching to support recovery.

Data Analysis

Following guidelines by Teresi et al. [37], feasibility was assessed through recruitment, retention, and adherence rates, reported as percentages. Exit interviews were conducted within two weeks of completing the intervention. Interviews (~45-60 minutes) were audio recorded, transcribed, and analyzed thematically using a qualitative software (MAXQDA, VERBI Software) [56, 57]. Two researchers independently reviewed transcripts and identified initial themes iteratively, and reconciled discrepancies through discussion with a third researcher to ensure that themes accurately reflected the data, reduce bias, and enhanced reliability by incorporating multiple perspectives of the data. Themes were compared to quantitative findings to assess congruency with and add context to the data [58].

Descriptive statistics were calculated for demographic, functional, physical, and psychosocial outcomes, comparing mean scores and distributions from baseline to post-intervention. Effect size, Cohen's *d* [59], was calculated with effects of .8, .5, and .2 indicating large, medium, and small effect sizes, respectively. Given the small sample size, inferential statistics were not conducted. Instead, effect sizes were used to provide a more meaningful interpretation of the magnitude of change. Energy expenditure data were retrieved using *Omnia* software, which was provided with the indirect calorimeter. The data were reduced to 30-second epochs, with the first and last 30-seconds of each assessment eliminated before calculating 30-sec average values (kcal/min). Total energy expenditure (kcal/min × session duration) and WOD-specific expenditure (kcal/min × WOD duration) included programmed exercises, transitions, and rest breaks were calculated.

RESULTS

Participants. The study included 12 participants, predominantly female (75%), aged 37 to 74 years, with 24.3% identifying as members of racial or ethnic minority groups. Participants reported various types of physical disabilities, with ataxia being the most common (n=5), followed by multiple sclerosis (n=3), SCI (n=2), general injury (n=1), and muscular dystrophy (n=1). Participants (n=7) used assistive devices either part- or full-time, with walkers and canes being the most common devices, followed by manual wheelchairs utilized by two participants. Complete participant demographics are presented in Table 3.

[INSET TABLE 3 HERE]

Feasibility Outcomes. Figure 1 shows the flow of participant recruitment, screening and onboarding, and retention, plus research activities and intervention. Thirty-seven individuals expressed interest in the study with 19 eligible participants providing consent, resulting in a 51% recruitment rate. Twelve participants began the intervention after six dropped during or shortly after baseline data collection. One participant withdrew at the start of the intervention, and another at week seven, both due to health issues unrelated to the intervention. Ten participants completed the 12-week program and post-testing, yielding an overall retention rate of 83%.

[INSERT FIGURE 1 HERE]

Overall, the attendance rate was 77.5%. On average, participants attended 2.33 sessions per week, totaling 27.9 sessions (out of 36 possible) over the 12-week intervention. No participant exceeded 36 sessions. Research staff conducted check-ins with participants who attended fewer than three sessions per week for two or more consecutive weeks.

Adverse Events. One non-injurious fall occurred during an intervention session. Three unrelated incidents (one fall and two cases of increased pain) occurred outside the sessions, prompting temporary adjustments to exercise routines (e.g., switching from standing to seated exercises) until normal participation was resumed.

Qualitative findings. Thematic analyses revealed themes related to study feasibility, including session structure, adaptive programming, and participation challenges and benefits. *Challenges* to participation included transportation difficulties, particularly during inclement weather, and scheduling conflicts, as class times (10am, 3pm) were difficult for those with full-time jobs. Some participants required assistance from spouses or care partners due to health changes (e.g., dizziness, new medications). Trainer quality was a key factor in participant satisfaction. Trainers were described as welcoming, inclusive, encouraging, and extremely knowledgeable on disability and exercise. Their ability to adapt movements effectively was highly valued. One participant noted, *"And then when I showed that I could do it, [primary trainer] stepped away and let me trust myself."* Another appreciated the emphasis on understanding exercises, stating, *"Questions are encouraged to understand what this is going to help you."* Participants valued the *camaraderie* with others who had similar disabilities, allowing for shared experiences, movement ideas, and collaboration. As one participant noted, it "*feels really good*" to be among peers. This sense of affiliation was echoed by another who stated, "*I just love being with the people. I do not have very many environments where I get to just be around other people with disabilities*." These connections extended beyond the sessions, as participants formed genuine friendships, attending community and personal events together.

Improvements in physical and functional health translated into greater confidence and independence. Participants reported strength gains, improved mobility, and increased stamina, making daily tasks easier. One participant noted, *"I'm just stronger. I'm able to pick things up easier, like off the ground."* Others highlighted improvements in dressing, gardening, and playing with grandchildren.

Functional outcomes. There was a large intervention effect on both the performance and satisfaction scores of the COPM, with large effect sizes (d=0.93 and d=1.04, respectively). Performance scores increased by an average of 1.3 points, while satisfaction with performance improved by an average of 2.2 points. Participants identified various important occupational activities, including functional mobility tasks such as walking, standing tolerance, or navigating stairs; personal care activities like medication management, bowel and bladder function, and transferring; productivity activities such as housekeeping, caring for pets, and cooking; and leisure activities, including traveling, gardening, and socializing with others outside the home. One participant reported a decline in perceived functional performance, reflecting that it was likely due to the progressive nature of their disability. The individual changes in both performance and satisfaction with performance are illustrated in Figures 2 and 3.

[INSERT FIGURES 2 & 3]

Physical outcomes. Both work capacity tests improved for participants from baseline to post-intervention period. The first work capacity assessed change in the number of repetitions completed plus calories rowed over five rounds. Participants improved by an average of 21.6 repetitions from baseline, showing a medium to large effect size (d=0.65). The second work capacity test evaluated participants' ability to complete 10 rounds of three activities as quickly as possible (For Time, in seconds). Participants demonstrated an average improvement of 285 seconds from baseline to post-intervention, with results indicating a large effect size (d=1.59). The individual changes in both work capacity tests are illustrated in Figures 4 and 5, and display the variability in participant responses, highlighting the diversity of responses within our sample and offering insight into how the intervention affected participants on an individual level. One participant's post-intervention work capacity test score for repetitions decreased. Initially, they required assistive grips (i.e., Active Hands®) to stabilize movements during baseline testing but no longer needed them post-intervention, which may have affected their performance measurement. While this change reflects an improvement in functional independence, the change led to a decrease in overall repetitions post-intervention.

[INSERT FIGURES 4 & 5]

Although changes in grip strength were observed, the effects were small (d=.13 non-dominant; d=.36 dominant). Flexibility testing showed small effects for left over right (d=0.36) and medium to large effects for right over left (d=0.64). The intervention had a small to medium effect on weight (d=0.40) and BMI (d=0.32). One participant opted out of weight and BMI assessments, and another was unable to perform the grip strength assessments.

Psychosocial outcomes. The intervention had a large effect on overall QOL (d=1.04) and self-efficacy (d=1.03). For participant perceived barriers, a medium effect was observed (d=.48). Table 4 presents all functional, physical, and psychosocial measure means, standard deviations, average changes, and effect sizes.

[INSET TABLE 4 HERE]

Energy expenditure. Eight participants (seven females; average age 55 years ± 14.9 years; and mean weight in kg 76.14 ± 43.29) completed an energy expenditure assessment. Average duration of the assessments for the entire session (i.e., warm-up, strength training, WOD, cool-down) was approximately 39 (± 9.5) minutes, while the WOD-only portion on average was 19.3 (± 4.3) minutes. Average energy expenditure for the entire session was 154.65 (± 65.5) kcals, while the WOD portion averaged 86.13 (± 42) kcals. The average energy expenditure was 4.47 (± 2.18) kcals per minute. Metabolic equivalents

(METs) were 3.27 ± 1.14 and 3.60 ± 1.23 for the entire session and WOD, respectively, indicating moderate intensity activity for this sample.

DISCUSSION

This study demonstrates the feasibility and effectiveness of a 12-week, community-based HIFT intervention for adults with mobility disabilities, yielding improvements in functional, physical, and psychosocial health. Participants reported high satisfaction with the intervention structure, exercise adaptations, and social support, aligning with prior findings that suggest HIFT can address health needs while reducing participation barriers[34-36]. While previous studies [35, 36] demonstrate feasibility of HIFT interventions, they were limited to specific populations (e.g., spinal cord injuries and Parkinson’s disease), single-site implementation, and reliance on physical therapists rather than HIFT trainers to deliver the intervention. This study expands HIFT’s applicability by including a broader population, multiple community-based settings, and certified HIFT trainers, contributing to a more comprehensive understanding of its feasibility and impact.

Feasibility and Recruitment

The final recruitment rate (51%), calculated as the number of participants who completed consent compared to those contacted, is comparable to those in recent HIFT trials for people with disabilities: 40%[35] and 44%[36]. Recruiting individuals with disabilities remains difficult due to comorbid conditions often leading to disqualification[60]. Retention (83%) and attendance (77.5%) rates suggest good adherence and sustainability once participants are engaged in the program. Similar retention and attendance rates were reported in previous HIFT trials: 83% retention; 77% attendance[35] and 80% retention; 73.7% attendance[36]. Trainer and peer accountability likely contributed to engagement, though session timing and travel remained barriers.

Despite safety measures, one non-injurious adverse event occurred during sessions, with other unrelated incidents reported outside the study. Trainers adapted sessions as needed, incorporating seated exercises or modifying movements to accommodate evolving health conditions, ensuring continued participation while minimizing risks. The collaboration with a community-based program provided participants with the opportunity to continue engagement post-intervention, with financial assistance (e.g., sliding scales, scholarships) available as needed. At follow-up, 80% remained active at 4 weeks, 70% at 8 weeks, and 50% at 24 weeks, similar to retention patterns in other disability-focused exercise studies.[14]

Functional, Physical, and Psychosocial Health Outcomes

Improvements in COPM scores reflect participants' self-reported functional gains. Although a two-point change in COPM scores has traditionally been considered clinically meaningful, a scoping review by McColl et al. [61] suggests that clinically significant thresholds may vary by population and context, underscoring the need for further validation. Complementary insights emerged from the qualitative analyses, as participants reported improved strength, stamina, and balance, which translated into greater confidence performing daily. Future studies should incorporate objective measures of functional health (e.g., timed mobility tests), to complement self-reported outcomes.

Work capacity test results indicate notable fitness gains, aligning with Crawford et al. [43], who found HIFT's unique combination of aerobic and resistance training enhanced physical work capacity in non-disabled adults. Changes in grip strength, flexibility, weight, and BMI were modest but trended positively.

Participants reported a strong sense of community and the supportive relationships with trainers likely contributed to their sustained engagement, similar to findings observed in previous studies [11, 62]. The autonomy-supportive environment (i.e., self-regulated intensity) and adaptive elements of the program were also highly valued by participants, aligning with recommendations from previous literature on designing exercise interventions for people with disabilities [62].

To our knowledge, this is the first study to assess energy expenditure in individuals with mobility disabilities during HIFT. The lower expenditure observed may be due to session structure, transitions between exercises, and mobility limitations affecting lower-body engagement. Prior studies [35, 36] have used Rate of Perceived Exertion (RPE) [63] to assess intensity, which may be a more suitable measure for capturing effort, especially in populations with diverse physical capabilities.

Strengths and Limitations

A key strength of this study is the real-world applicability of the intervention, as the study was conducted in a community-based fitness setting with HIFT trainers, meeting the need for more real-world research that addresses accessibility and motivational barriers, adapts contextual factors to promote inclusion, and supports sustained participation[21, 22, 64]. Moreover, the HIFT program was designed to accommodate a variety of disability types, allowing participants to engage in ways that were personalized, manageable, and adaptable. However, challenges related to attendance, particularly due to session scheduling, were noted. Future interventions may benefit from offering more flexible class schedules to improve accessibility. Although the sample included some participants from minoritized backgrounds, the overall lack of racial and ethnic diversity limits the generalizability of findings—particularly given the documented disparities in disability-related health outcomes across demographic groups[1].

Although we observed positive changes in functional, physical, and psychosocial outcomes, the small sample size may have led to an inaccurate estimation of the intervention's effects and prevented a more detailed analysis of within-sample differences, such as how participants with different types of mobility disabilities responded to the intervention. Future studies should include a comparison group and a larger, more diverse sample to better understand these nuanced effects and to ensure that any changes in outcomes can be more confidently attributed to the intervention.

CONCLUSION

This study demonstrates that HIFT can be a feasible and effective strategy for improving functional, physical, and psychosocial health in adults with mobility disabilities. The findings highlight the potential for such programs to bridge the gap between clinical interventions and long-term community-based exercise engagement for this population.

Declarations

Author Contributions: LMK conceptualized the study, led the manuscript writing, and oversaw all aspects of study implementation. JED and RAW contributed to study conceptualization, design, intervention development, and interpretation of findings. JRS and MMK coordinated study recruitment, data collection, data management, and contributed to data analysis and interpretation. RH and KH provided clinical support for the intervention and data collection procedures and contributed to interpretation and presentation of the findings. All authors critically reviewed the manuscript and approved the final version.

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Declaration of Conflicts of Interest: The authors declare no conflicts of interest related to this study.

Ethical Approval: This study was approved by the Institutional Review Board (IRB) at the University of Kansas (Approval Number: [00148684]).

Informed Consent: All participants provided informed consent prior to participation. Participants were informed of the study's purpose, procedures, potential risks, and benefits, and they had the opportunity to ask questions before consenting. Participation was voluntary, and individuals were free to withdraw at any time without consequence.

Data Availability Statement: The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

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Tables

Table 1.

Sample HIFT workout of the day (WOD) for both standing and seated participants

Session Type	Standing	Seated
As many rounds as possible (AMRAP)	10-min AMRAP: 10 Burpees; 5 squats; 10 push-ups; 5 dips	10-min AMRAP: 10 slam balls; 5 dips; 5/5 shoulder presses; 3 dips
Rounds for Time (RFT)	3 RFT: 20 squats; 20 sit-ups; 20 shoulder press; 20 kettlebell swings	3 RFT: 12 dips; 40 weighted twists; 20 dumbbell shoulder press; 20 dumbbell front raise
Every minute on the minute (EMOM)	12-mins: Min 1: 18 alternating dumbbell row; Min 2: 200-meter bike; Min 3: 9 deadlifts; Min 4: rest (repeat for rest of time)	12-mins: Min 1: 18 alternating dumbbell row; Min 2: 200-meter bike; Min 3: 10 side-to-side deadlifts; Min 4: rest (repeat for rest of time)

Table 2. *Work Capacity Test Details*

Work Capacity Test	Description	Outcome Measured
Test 1: Rowing and Ground to Overhead (G2OH)	Five rounds alternating between rowing and performing ground-to-overhead (G2OH) with a plate. Each round included 1 minute of work followed by 1 minute of rest.	Total repetitions + total calories rowed
Test 2: 10-Round Circuit	Complete 10 rounds of a circuit including: 3-calorie bike, 6 alternating shoulder presses (non-ambulatory) or step-ups (ambulatory), and 9 slam balls (non-ambulatory) or box squats (ambulatory).	Total time to complete all 10 rounds (in seconds)

Table 3. *Participant demographics and descriptives.*

Group Variable	Category	*n*	%
Sex	Female	10	75
	Male	2	25
Age	Range (37-74 years of age; Mage 56.8, SD 13.6 years)		
	18-35	1	8.3
	36-54	3	25
	55-79	8	66.7
Education	College or more	12	100
Race	White	9	75
	Black / African American	2	16
	Asian	1	8.3
Hispanic/ Latino	Yes	0	0
	No	5	41.7
	Do not wish to answer	7	58.3
	No response	0	0.0
Marital Status	Married	7	58.3
	Divorced	2	16.7
	Never been married	3	25
Income	<$50,000	3	25
	$50,000-$100,000	4	33.3
	> $100,000	2	16.7
	Do not wish to answer	3	25
Disability Type	Neurological (Ataxia, Multiple Sclerosis)	9	75
	Injury (Spinal Cord Injury/Disease)	3	25
Assistive Devices	Yes, utilizes assistive devices (e.g., cane, walker, manual/power wheelchair, orthotic devices)	10	83.3
	No, does not utilize assistive devices	2	16.7

Table 4. Functional, physical, and psychosocial outcome means and standard deviations at intervention baseline and endpoint plus mean change and standard deviation, and effect size

Measure	N	Baseline	Endpoint	Change	Effect size (Cohen's d)
Functional Outcomes					
Performance COPM [a]	10	4.48 (±1.11)	5.80 (±1.55)	1.3 (±1.32)	d=0.93*
Satisfaction COPM [a]	10	2.89 (±1.51)	5.09 (±2.13)	2.2 (±2.12)	d=1.04*
Physical Outcomes					
Work Capacity- Repetitions [b]	10	128.9 (±48.7)	150.5 (±25.2)	21.6 (±33.4)	d=.65
Work Capacity- Time (seconds) [c]	10	1548.9 (±303.5)	1263.9 (±240.3)	-285.0 (±179.3)	d=1.59*
Grip Strength Dominant (kg) [d]	9	24.1 (±6.9)	24.3 (±4.4)	0.181 (±4.6)	d=.04
Grip Strength Non-Dominant (kg) [d]	9	23.2 (±7.03)	23.9 (±4.8)	0.599 (±4.7)	d=.13
Upper Body Flexibility - Left Over Right (inches) [e]	10	-7.6 (±6.8)	-7.1 (±6.4)	-0.513 (±1.4)	d=.36
Upper Body Flexibility – Right over Left (inches) [e]	10	-6.2 (±7)	-5.5 (±6.8)	-0.65 (±1.02)	d=.64
Weight (kg)[f]	9	81.2 (±41.3)	80.3 (±39.3)	-0.91 (±2.3)	d=.40
BMI (kg/m^2)[g]	9	30.2 (±18.1)	29.9 (±17.3)	-0.289 (±0.9)	d=.32
Psychosocial Outcomes					
Quality of Life Overall [h]	10	3.6 (±0.46)	3.8 (±0.38)	0.224 (±0.2)	d=1.04*
Self-Efficacy [i]	10	3.79 (±0.47)	4.17 (±0.38)	0.38 (±0.37)	d=1.03*
Barriers [j]	10	1.72 (±0.28)	1.60 (±0.25)	-0.12 (±0.25)	d=.48

*Indicates large effects (i.e., ≥ .700)

[a] = Responses range from 1-10, where the higher scores indicate better perceived performance and satisfaction with performance

[b] = continuous variable where final score was total repetitions + calories rowed of five rounds max calorie row and plate ground to overhead, working one minute, resting one minute.

[c] = continuous variable where final score was the time in seconds it took to complete 10 rounds of three calorie bike, six alternating step-ups (ambulatory) or dumbbell presses (non-ambulatory), and nine box squats (ambulatory) or slam balls (non-ambulatory)

[d] = Grip strength was measured in kilograms for both the dominant and non-dominant hands

[e] = Flexibility was measured in inches to the nearest half an inch for both sides (right over left, and left over right). Negative scores indicate a distance between fingertips, where as positive scores indicate overlap between fingers. Thus, more positive scores indicate greater flexibility.

[f] = Weight was measured in kilograms (kg) to the nearest 0.1kg.

[g] = BMI was calculated using weight in kg divided by height in meters squared

[h] = Responses range from 1-5, where the higher scores indicate better perceived quality of life

[i] = Responses range from 1-5, where the higher scores indicate higher self-efficacy

[j] = Responses range from 1-4, where lower scores indicate less perceived barriers to health behavior.

Figures

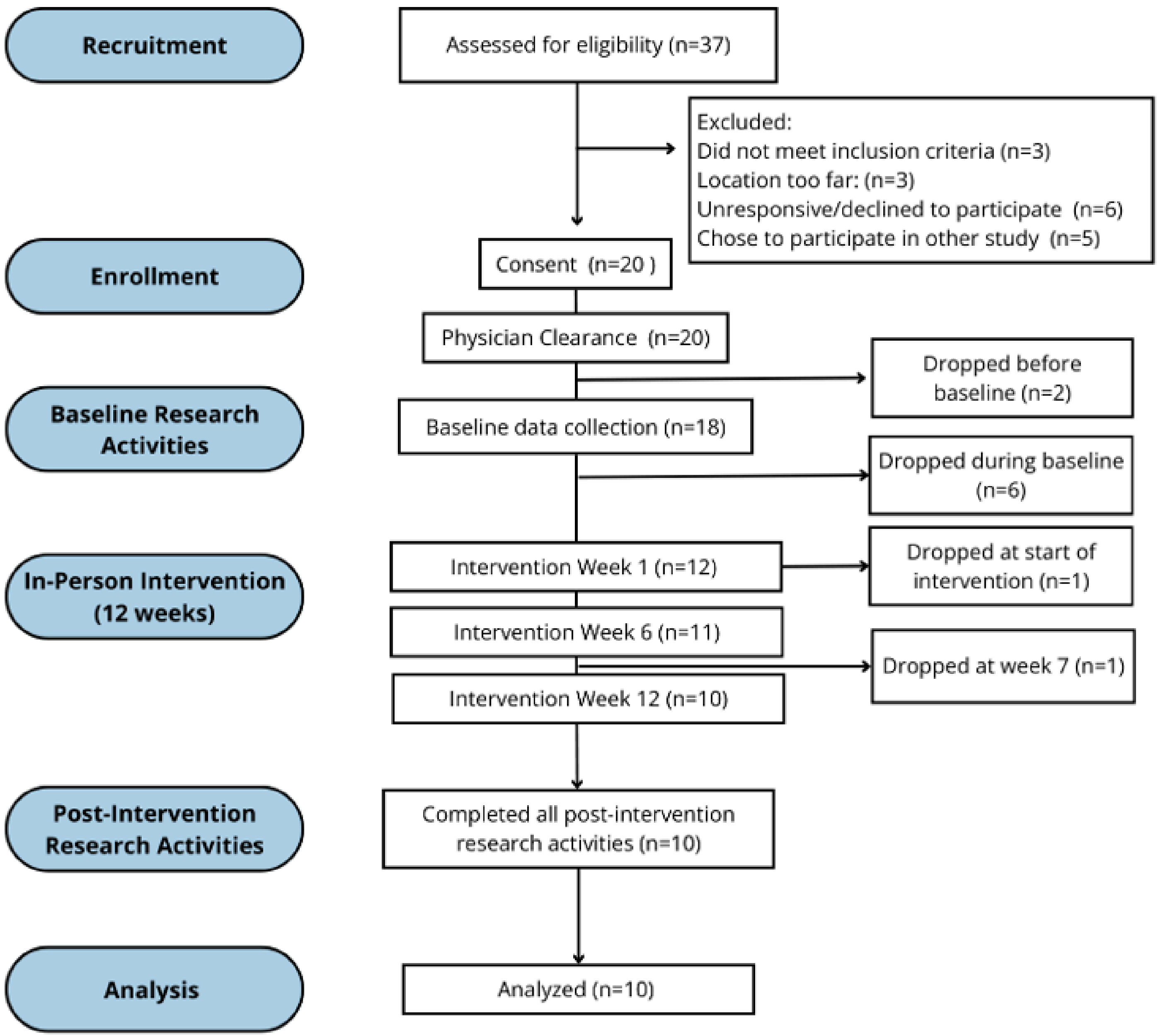

Figure 1

Participant flow through study, including recruitment, screening and onboarding, and retention.

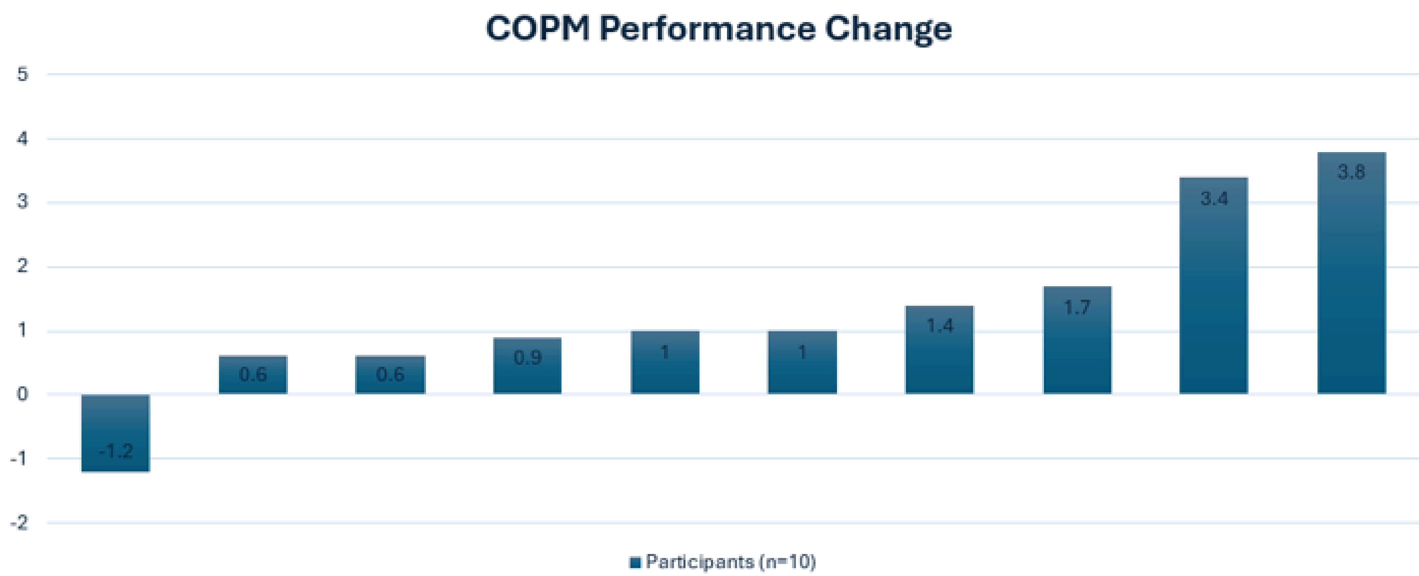

Figure 2

Individual change in COPM Performance outcomes

Change scores reflect the difference from baseline to post-intervention on a 1-10 scale. Higher scores indicate greater perceived improvement in performance on meaningful occupational activities, while negative scores indicate a decline.

Alt text: Bar chart showing individual participant changes in perceived performance on occupational tasks from baseline to post-intervention, with most showing improvements.

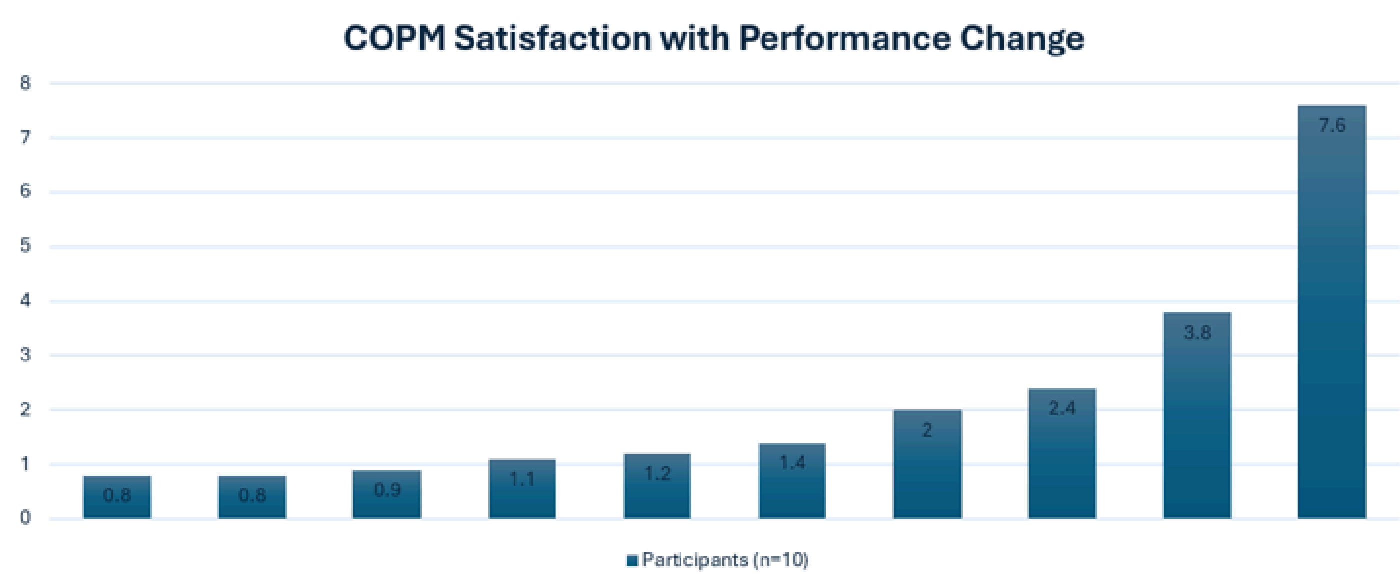

Figure 3

Individual change in COPM Satisfaction with Performance outcomes

Scores represent changes from baseline to post-intervention on a 1-10 scale, indicating improved satisfaction with performance in important occupational activities. Positive changes reflect increased satisfaction with performance.

Alt text: Bar chart displaying individual improvements in satisfaction with performance of daily tasks. Most participants showed increased satisfaction post-intervention.

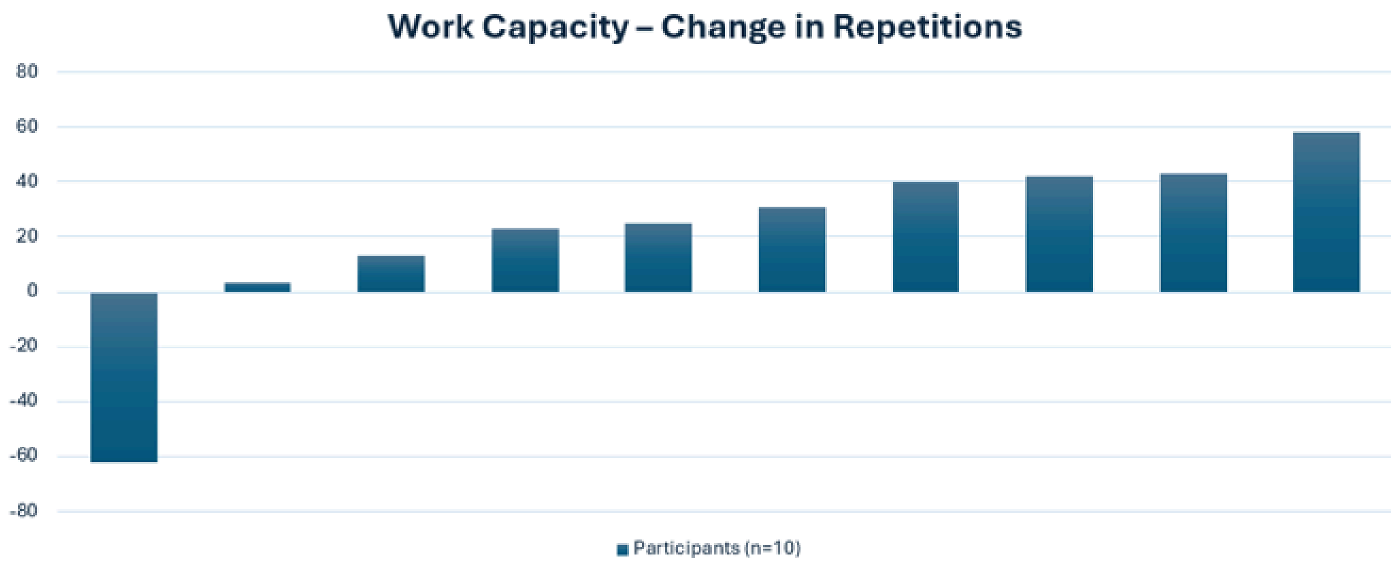

Figure 4

Individual change in Work Capacity (repetition) outcomes

Change is calculated as the difference in total repetitions (repetitions + calories rowed) from baseline to post-intervention during a maximum effort interval. Positive scores indicate improved work capacity, while negative scores suggest a decline.

Alt text: Bar graph showing individual changes in total repetitions and calories rowed during a 5-round fitness test. Most participants improved from baseline to post.

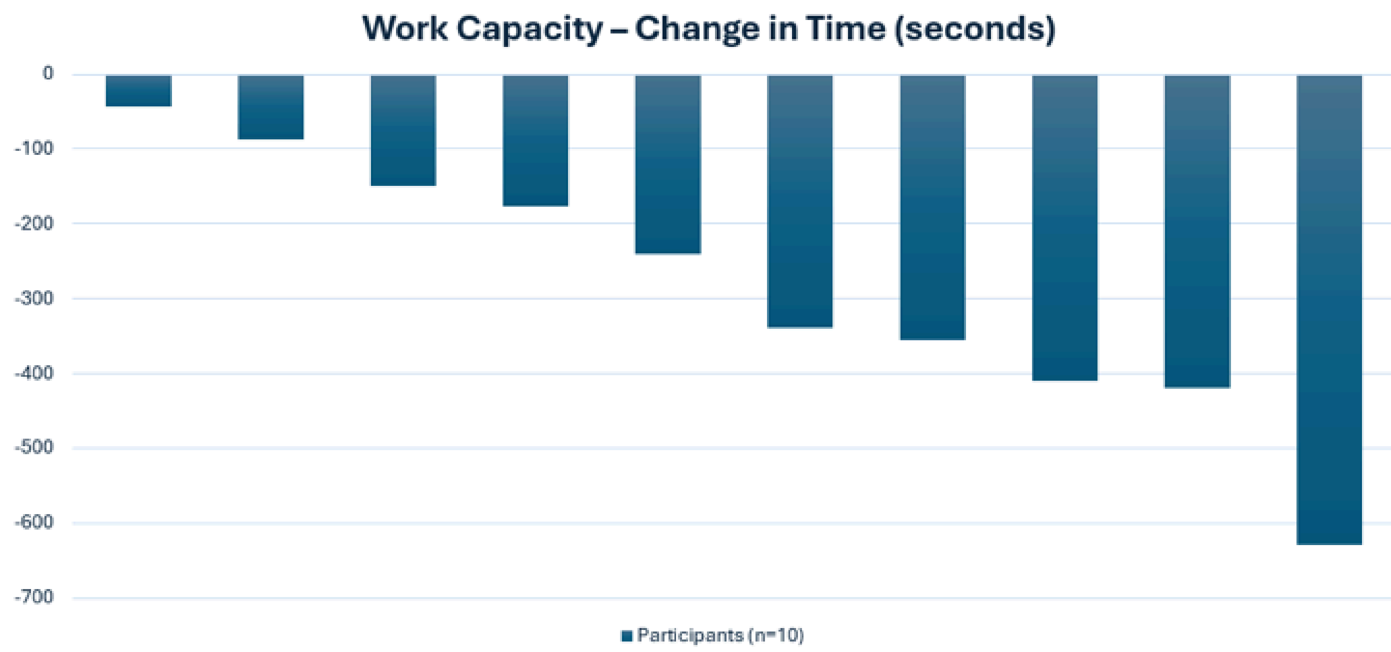

Figure 5

Individual change in Work Capacity (time in seconds) outcomes

Change reflects the difference in time taken to complete a 10-round circuit from baseline to post-intervention. More negative scores signify faster completion, indicating improved work capacity.

Alt text: Bar graph showing change in time to complete a 10-round circuit. Most participants had decreased times, indicating improved fitness.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- CONSORT2010Checklist.doc