

대한물리치료과학회지

Journal of Korean Physical Therapy Science

2026. 09. Vol. 33, No 3, pp. 20-32

Wearable Supported High Intensity Telerehabilitation After Chronic Stroke: A Pilot Study

Hyun Min Moon, Ph.D., P.T.

*Dept. of Rehabilitation Medicine, Bundang Jesaeng Hospital,
Cardiopulmonary Rehabilitation Clinic*

Abstract

Background: Stroke survivors often have reduced aerobic capacity and limited access to intensive therapy. Scalable models that preserve training dose are needed. This external pilot tested whether wearable-supported telerehabilitation can deliver high-intensity interval training (HIIT) comparable to supervised, in clinic care.

Design: Randomized controlled trial

Methods: I conducted a parallel, three arm external pilot randomized controlled trial in ambulatory adults ≥ 6 months post-stroke ($n=21$; 7/group). Participants were randomised to 6 weeks of high-intensity telerehabilitation (HIT), high-intensity face to face rehabilitation (HIF), or moderate-intensity face to face rehabilitation (MIF). Primary outcomes were VO_2 max and HRmax from graded cycle testing; secondary outcomes were 6-Minute Walk distance (6MWT), 10-Meter Walk Test (10MWT), Timed Up and Go (TUG), and fasting low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides. Within-group change was tested with Wilcoxon; between-group differences with Kruskal-Wallis followed by Dunn-Holm (two-sided $\alpha<0.05$).

Results: Groups were comparable at baseline.

VO_2 max increased in HIT and HIF, but not in MIF; the between-group difference favored the HIIT arms. HRmax rose only in HIT. 10MWT and TUG improved across all groups, while 6MWT increased in HIT and HIF; mobility outcomes showed no significant between-group differences. Lipid profiles did not change meaningfully over six weeks.

Conclusion: With real-time monitoring and coaching to maintain intensity targets, telerehabilitation achieved physiological and functional gains comparable to in-clinic HIIT, supporting feasibility for ambulatory, technology-ready stroke survivors; a fully powered, longer trial is warranted to confirm effectiveness and durability.

Key words: High-intensity interval training, Stroke, Telerehabilitation

Corresponding author

Hyun Min Moon
20 Seohyeon-ro 180beon-gil, Gyeonggi, Korea
T: 031-779-6515, E: nabuday11@hanmail.net

I . Introduction

Globally, stroke incidence has climbed by 85% over the past three decades, yet many survivors still do not receive the recommended volume of rehabilitation, underscoring the need for scalable delivery models (Cieza et al., 2021). Telerehabilitation is one such model, and a recent trial showed that home-based programs can achieve functional outcomes comparable to usual center-based care (Asano et al., 2021). Functional status often peaks around six months post-stroke before gradually declining (Dhamoon et al., 2009), yet intensive rehabilitation in the chronic phase can enhance recovery and continued participation is linked to better long-term outcomes (Chumbler et al., 2012; Rozevink et al., 2021). Supervised community-based programs extending up to one year post-discharge further accelerate recovery and align with guidelines recommending ongoing rehabilitation until patient-specific goals are met (Koh et al., 2012). Traditional home-exercise programs, however, often struggle with adherence because of limited motivation, enjoyment, and feedback (Neibling et al., 2021). Telerehabilitation can help address these barriers by providing real-time feedback, greater engagement, and improved accessibility even under constrained conditions (Marin-Pardo et al., 2021), and combining telerehabilitation with wearable sensors further strengthens remote supervision, as sensor-derived metrics can be used both to guide exercise performance and to provide continuous biofeedback that supports structured therapy and daily physical activity (Ciorte et al., 2021; Patel et al., 2012).

Stroke survivors remain at high risk of recurrent ischaemic events and other cardiovascular complications after the index stroke (Elkind, 2009). Against this background, moderate- to high-intensity aerobic exercise is recommended as a core component of secondary cardiovascular prevention because it improves cholesterol and other lipid parameters that are key cardiovascular risk markers (Mann et al., 2014). In patients with coronary artery disease, high-intensity interval training (HIIT), defined as brief bouts of vigorous exercise interspersed with recovery, has been shown to increase peak oxygen uptake more than volume-matched moderate-intensity continuous training (MICT) (Rognmo et al., 2004). Among people after stroke, high-intensity aerobic training protocols, including HIIT, are feasible and can elicit clinically meaningful gains in cardiorespiratory fitness and walking capacity, although existing trials are heterogeneous and the optimal protocol and relative advantages over MICT remain unclear (Baricich et al., 2024). Most telerehabilitation programmes after stroke have targeted motor function, balance, gait, activities of daily living and higher cortical function, with little emphasis on structured high-intensity aerobic training or on direct comparisons between remote and centre-based delivery (Sarfo et al., 2018). Therefore, a three-arm external pilot randomised controlled trial was designed including high-intensity telerehabilitation (HIT), high-intensity face to face rehabilitation (HIF) and moderate-intensity face to face rehabilitation (MIF) in adults with chronic stroke who were able to walk independently, to assess the feasibility of these three training models and to obtain preliminary estimates of their effects on cardiopulmonary and functional outcomes, with the ultimate goal of providing design parameters for a future definitive trial.

II. Methods

1. Study Design

This study employed a three-arm parallel external pilot randomized controlled design to evaluate the feasibility and variance estimates of high-intensity rehabilitation programs in chronic stroke. Twenty-one participants (seven per group) were prespecified to ensure procedural feasibility and adequate precision for feasibility outcomes.

2. Sample Size Calculation

This trial was designed as a pilot randomised controlled trial; accordingly, the target sample size was based on feasibility and on obtaining design parameters for a future definitive trial rather than on a formal efficacy calculation (Eldridge et al., 2016). In patients with recent transient ischaemic attack or minor ischaemic stroke, a mean peak oxygen uptake ($\text{VO}_{2\text{peak}}$) of 22 mL·kg·min with a standard deviation of 6 mL·kg·min has been reported, and this standard deviation was used when planning the present study (Boss et al., 2017). Using a standard deviation of 6 mL·kg·min and a clinically important between-group difference of 3.5 mL·kg·min, slightly smaller than the mean $\text{VO}_{2\text{peak}}$ gain of 3.8 mL·kg·min observed for high-intensity interval training versus continuous aerobic training after stroke (Anjos et al., 2022), approximately 45 participants per group would be required to achieve about 80% power at a two-sided alpha of 0.05 in a two-group comparison. Under the same assumptions, the present pilot trial with 7 participants per group provides only approximately 20% power, and was therefore not configured for definitive efficacy testing but rather to yield exploratory between-group estimates and design parameters for a future main trial.

3. Randomization and Blinding

Participants were randomly assigned (1:1:1) using permuted block randomization with allocation concealment by sequentially numbered, opaque, sealed envelopes. Outcome assessors and statistical analysts were blinded to group allocation.

4. Participants

Participants were recruited from inpatient wards and outpatient clinics. Eligibility required ≥ 6 months post-stroke, independent ambulation ≥ 10 m, and familiarity with an iPhone and Apple Watch (Series 6 or 7). Inclusion thresholds were MMSE-K ≥ 24 , FAC ≥ 4 , BBS ≥ 41 , FRT ≥ 25 cm, ability to complete a 6-Minute Walk Test (with/without an ankle-foot orthosis), and no current lipid-lowering medication. Exclusions were arrhythmia, hypertension, diabetes, Chronic Obstructive Pulmonary Disease, congestive heart failure, unstable angina, peripheral arterial disease, orthopedic limitations,

depression, and any condition precluding exercise testing or high-intensity training (Moon, 2026).

5. Intervention and safety protocols

Delivery was standardized and safety enforced via pre-session education (HIIT/MICT, explicit stop criteria), checklist-guided sessions, and three rehearsals of fall-prevention steps (safety handles, emergency-stop, safety clip) at session start. Remote monitoring used a device-mounted smartphone for continuous visual checks, an Apple Watch for real-time HR kept visible on the handle, and earphones for uninterrupted coaching; standardized cues kept HR within prescription. Before each remote session, location and emergency contacts were verified; daily assistant notes to the principal investigator, telephone clarifications, and twice-weekly meetings ensured adherence. During all training sessions in all three groups, the treating therapist continuously checked the heart-rate trace on the smartwatch or ECG monitor and adjusted treadmill or cycle workloads to maintain the pre-specified training zone. At the end of each session, session attendance, any symptoms or adverse events, and whether the target heart-rate range had been maintained were documented on standardized case report forms used in this trial.

1) High-Intensity Telerehabilitation (HIT)

Participants received 40 minutes of high-intensity interval training (HIIT) remotely via mobile video calls (including 5 minutes each of warm-up and cool-down), in addition to 30 minutes of on site physical therapy (Sarfo et al., 2018). The HIIT protocol included six cycles of 1 minute at 80-100% HR_{max} followed by 4 minutes of active recovery at <60% HR reserve, using treadmill or cycle ergometer (Gjellesvik et al., 2020). Real-time heart rate monitoring was conducted via Apple Watch, with continuous therapist engagement through audio-visual feedback to ensure target intensity (Boyne et al., 2023). The training locations included parks, gyms, and sports centers, with participants choosing a familiar and comfortable place. A detailed, stepwise description of the 40-minute HIT sessions (warm-up, interval structure, cool-down), including safety procedures and real-time heart-rate monitoring, is provided in Supplementary File 1.

2) High-Intensity Face to Face Rehabilitation (HIF)

The HIF group received the same HIIT protocol as HIT, conducted in a hospital-based cardiopulmonary rehabilitation setting. Heart rate was monitored in real time using a wireless telemetry ECG system (Q-Tel RMS). Training adjustments were made based on therapist instructions to maintain target heart rate (Boyne et al., 2023). The structure and content of the 40-minute high-intensity interval training sessions (warm-up, interval structure, and cool-down) are described in detail in Supplementary File 1.

3) Moderate-Intensity Face to Face Rehabilitation (MIF)

MIF group underwent continuous moderate-intensity training for 30 minutes at 60–80% HRmax following the same warm-up and cool-down protocol. Training modalities and monitoring were identical to those of the HIF group, and heart rate was continuously tracked using ECG telemetry (Marzolini et al., 2023). The structure and content of the 40-minute moderate-intensity continuous training sessions (warm-up, 30-minute continuous phase, and cool-down) are described in detail in Supplementary File 1.

6. Outcome Measures

1) Cardiovascular Function

Cardiorespiratory fitness was assessed using a graded exercise test on a bicycle ergometer (Quinton Cardiology Systems, USA) with concurrent electrocardiography (Quinton, USA) and respiratory gas analysis (ParvoMedics, USA) (Pritchard et al., 2021). The protocol followed ACSM guidance, starting at 25 W and increasing by 25 W every 3 minutes up to 100 W while maintaining a cadence of 50 rpm (Löllgen & Leyk, 2018). Testing was terminated when at least two of the following criteria were met: rating of perceived exertion (RPE) ≥ 18 , respiratory exchange ratio (RER) ≥ 1.15 , or $\geq 90\%$ of predicted maximal heart rate (HRmax). Testing was also terminated if excessive blood pressure elevation, dyspnea, or chest pain occurred (American College of Sports Medicine, 2013). Primary outcomes were maximal oxygen uptake ($\text{VO}_{2\text{max}}$) and HRmax. Ambulatory heart rate during the 6-minute walk test was continuously monitored using Apple Watch Series 6 and 7. Prior work shows near-perfect agreement between Apple Watch-derived heart rate and ECG-based reference devices ($r = 0.99$), supporting its clinical validity and reliability (Khushhal et al., 2024).

2) Gait Ability

Gait ability was evaluated by the 6-Minute Walk Test (6MWT), Timed Up and Go (TUG), and 10-Meter Walk Test (10MWT). The 6MWT measured total walking distance over 6 min on a 20-m indoor track (ICC=0.94) (Steffen et al., 2002). TUG assessed functional mobility (ICC=0.99) (Steffen et al., 2002). The 10MWT assessed walking performance on a 14-m walkway, with the central 10-m segment timed and averaged across three trials (ICC=0.89–1.00) (Steffen et al., 2002).

3) Hematological Variables

Venous blood samples (5 mL, after a 12-hour fast) were centrifuged (1300 $\times$ g, 10 min), and serum aliquots were stored at -70°C . Laboratory assays measured low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides.

7. Data analysis

Data were analyzed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Baseline between-group comparisons used the Kruskal-Wallis test for continuous variables and Fisher's exact test for categorical variables. Within-group pre-post changes were tested with the Wilcoxon signed-rank test, and between-group differences in change scores were evaluated with the Kruskal-Wallis test followed when the omnibus test was significant ($p < 0.05$), by Dunn's pairwise comparisons with Holm adjustment. Statistical significance was set at $\alpha < 0.05$.

III. Results

1. Baseline characteristics

Groups were comparable at baseline across anthropometrics, cognition, and time since stroke; distributions of sex, diagnosis, and affected side were also similar (all $p > 0.05$) (Table 1).

Table 1. General characteristics of the participants ($N=21$)

Variable	HIT group ($n=7$)	HIF group ($n=7$)	MIF group ($n=7$)	p
Height (cm)	165.71 (6.53) ^a	166.36 (5.59)	166.45 (5.47)	0.444
Weight (kg)	62.66 (5.75)	64.24 (6.24)	65.60 (3.93)	0.219
Age (years)	47.33 (10.72)	54.35 (8.94)	49.79 (8.33)	0.528
Korean Mini-Mental State Examination (score)	28.13 (1.18)	28.56 (0.93)	28.42 (1.06)	0.660
Onset (months)	34.62 (4.31)	31.81 (6.26)	32.06 (6.02)	0.478
Gender				
Male	3 (42.9%)	5 (71.4%)	4 (57.1%)	0.856
Female	4 (57.1%)	2 (28.6%)	3 (42.9%)	
Diagnosis				
Infarction	5 (71.4%)	6 (85.7%)	5 (71.4%)	0.266
Hemorrhage	2 (28.6%)	1 (14.3%)	2 (28.6%)	
Affected side				
Left	3 (42.9%)	3 (42.9%)	2 (28.6%)	0.326
Right	4 (57.1%)	4 (57.1%)	5 (71.4%)	

Note. ^aMean (SD). Percentages, n (%). Kruskal-Wallis (continuous). Fisher's exact (categorical). MMSE, mini-mental state examination. HIT group, High-intensity telerehabilitation. HIF group, High-intensity face to face rehabilitation. MIF, Moderate-intensity face to face rehabilitation.

2. Cardiovascular function

VO₂max increased in HIT and HIF (within-group $p<0.01$) but not in MIF; the between-group change differed significantly, favoring HIT/HIF over MIF. HRmax rose only in HIT ($p<0.001$). Heart rate while walking showed no material change or between-group effect (Table 2).

Table 2. Changes in Cardiovascular function according to experimental method

Variable	HIT group ($n=7$) (A)			HIF ($n=7$) (B)			MIF ($n=7$) (C)			H(p)	Post-hoc (Holm)
	Pre-test	Post-test	Change	Pre-test	Post-test	Change	Pre-test	Post-test	Change		
VO ₂											
max	19.33±2.66 ^a	21.95±2.57	2.62±1.59**	18.99±1.34	22.60±1.88	3.61±0.86***	19.70±0.63	19.72±0.93	0.02±1.03	12.854(0.002)	C<A,B
(ml/kg/min)											
HRmax	164.52±4.06	171.69±4.52	7.16±2.71***	163.25±6.74	164.43±10.68	1.19±6.61	168.61±6.23	168.62±5.30	0.01±3.71	6.971(0.031)	C<A
(bpm)											
HW	107.24±5.42	106.28±9.28	-0.95±6.03	107.14±4.39	104.56±5.45	-2.58±4.67	108.31±3.75	108.96±7.20	0.65±5.76	1.284(0.528)	n/a
(bpm)											

Note. ^aMean±SD. Significant differences between pre and post-test (* $p<0.05$, ** $p<0.01$, *** $p<0.001$). HIT group, High-intensity telerehabilitation. HIF group, High-intensity face to face rehabilitation. MIF, Moderate-intensity face to face rehabilitation. HW, Heart rate while walking. n/a, not applicable.

3. Gait ability

All groups improved on 10MWT and TUG (all $p<0.05$), with no significant between-group differences. 6MWT increased in HIT and HIF (both $p<0.05$). The between-group effect was not significant (Table 3).

Table 3. Changes in Gait ability according to experimental method

Variable	HIT group ($n=7$) (A)			HIF ($n=7$) (B)			MIF ($n=7$) (C)			H(p)	Post-hoc (Holm)
	Pre-test	Post-test	Change	Pre-test	Post-test	Change	Pre-test	Post-test	Change		
10MWT	14.73±1.13 ^a	12.14±1.88	-2.60±1.63**	13.96±2.20	12.95±2.58	-1.01±1.05*	13.83±2.52	12.78±2.59	-1.05±1.10*	5.351(0.069)	n/a
(s)											
TUG	15.89±1.61	13.97±1.87	-2.45±1.54**	15.20±1.61	13.97±1.87	-1.23±1.04*	13.18±3.73	11.83±7.09	-1.35±5.23*	2.473(0.291)	n/a
(s)											
6MWT	281.25±28.03	288.41±34.90	7.16±18.81*	294.30±25.22	310.26±22.63	15.96±14.07*	314.57±19.35	328.78±17.85	14.20±15.41	0.722(0.698)	n/a
(m)											

Note. ^aMean±SD. Significant differences between pre and post-test (* $p<0.05$, ** $p<0.01$, *** $p<0.001$). HIT group, High-intensity telerehabilitation. HIF group, High-intensity face to face rehabilitation. MIF, Moderate-intensity face to face rehabilitation. 10MWT, 10-Meter Walk Test. TUG, Timed Up and Go test. 6MWT, 6-Minute Walk Test. n/a, not applicable.

4. Hematological variables

LDL, HDL, and triglycerides showed no significant within-group changes and no between-group differences (Table 4).

Table 4. Changes in Hematological variables according to experimental method

Variable	HIT group (n=7) (A)			HIF (n=7) (B)			MIF (n=7) (C)			H(p)	Post-hoc (Holm)
	Pre-test	Post-test	Change	Pre-test	Post-test	Change	Pre-test	Post-test	Change		
LDL (mmol/L)	2.04±0.3 1 ^a	1.96±0.26	-0.08±0.3 1	2.45±0.30	2.29±0.38	-0.16±0.2 0	2.23±0.33	2.22±0.35	-0.01±0.10	3.951(0.138)	n/a
HDL (mmol/L)	1.54±0.08	1.55±0.13	0.01±0.12	1.43±0.12	1.53±0.17	0.1±0.12	1.55±0.14	1.55±0.24	0.001±0.11	5.254(0.072)	n/a
TG (mmol/L)	1.49±0.08	1.42±0.31	-0.07±0.3 1	1.59±0.05	1.55±0.28	-0.04±0.2 9	1.49±0.19	1.48±0.24	-0.01±0.33	0.211(0.901)	n/a

Note. ^aMean±SD. Significant differences between pre and post-test (* $p<0.05$, ** $p<0.01$, *** $p<0.001$). HIT group, High-intensity telerehabilitation. HIF group, High-intensity face to face rehabilitation. MIF, Moderate-intensity face to face rehabilitation. LDL, Low density lipoprotein cholesterol. HDL, High density lipoprotein cholesterol. TG, Triglyceride. n/a, not applicable.

IV. Discussion

This pilot study demonstrates that a 6-week high-intensity interval training program, delivered either via telerehabilitation or face to face, can significantly enhance cardiorespiratory fitness and gait function in chronic stroke survivors. Importantly, the comparable improvements observed between the remote and in-person HIIT groups underscore the feasibility of telerehabilitation as an effective alternative to conventional center-based rehabilitation. Across the three pre-specified outcome domains cardiovascular function, gait ability, and hematological variables the overall pattern of change favored high-intensity training over moderate-intensity control and was broadly similar between the two high-intensity delivery modes.

Across the cardiovascular outcomes, VO_2max showed the most consistent training-related change, improving in both high-intensity groups but not in the moderate-intensity group, suggesting that meaningful gains in aerobic capacity in this population depend more on training intensity than on session volume (Ivey et al., 2015). This intensity-dependent pattern is consistent with reports that high-intensity interval training produces larger improvements in peak oxygen uptake than continuous moderate-intensity aerobic training in people with stroke and other cardiovascular diseases (Marzolini et al., 2023). Because higher cardiorespiratory fitness is strongly and progressively associated with lower risks of recurrent cardiovascular events and all-cause mortality, even modest training-related gains in VO_2max are likely to be clinically relevant for individuals with cerebrovascular disease (Ross et al., 2016). Taken together, this VO_2max pattern suggests that carefully prescribed and monitored high-intensity programmes, including telerehabilitation, can be used to address low aerobic capacity in appropriately

screened chronic stroke survivors. These observations should, however, be confirmed in larger, adequately powered trials before firm conclusions are drawn about the comparative effectiveness of different delivery models.

Heart-rate outcomes helped to interpret both delivered intensity and cardiovascular safety: in this trial, HRmax increased significantly only in the HIT group, whereas heart rate during the 6-minute walk test did not change materially within or between groups, indicating that measurable adaptation was confined to peak rather than usual-paced exertion (Löllgen & Leyk, 2018). Because chronotropic incompetence a blunted rise in heart rate with increasing workload is associated with exercise intolerance and adverse cardiovascular prognosis, a higher attainable HRmax after training without new symptoms or arrhythmias is consistent with a favourable chronotropic adjustment rather than an undesirable tachycardic response (Brubaker & Kitzman, 2011). High-intensity interval programmes that deliberately drive heart rate to about 85-95% of HRmax generally produce larger cardiorespiratory adaptations than moderate-intensity continuous training, supporting the rationale for HRmax-guided intervals in the present HIT model (Wisløff et al., 2009). Post-stroke HIIT trials that achieve higher training heart rates than moderate-intensity comparators have reported greater gains in cardiorespiratory fitness, which is compatible with the heart-rate pattern favouring high-intensity training in this study (Marzolini et al., 2023). However, because both high-intensity programmes used identical heart-rate targets and the sample was small and variable, the selective HRmax increase observed in HIT should be regarded as an exploratory signal rather than firm evidence that HIT is superior to centre-based high-intensity training (HIF) (Eldridge et al., 2016). Taken together, these heart-rate findings mainly show that remotely supervised high-intensity training can safely achieve higher peak cardiovascular stress without increasing heart-rate demands during usual-paced walking, supporting the feasibility of integrating supervised moderate-to-vigorous aerobic exercise, including tele-rehabilitation-based high-intensity sessions, into chronic stroke rehabilitation in line with current post-stroke exercise recommendations (MacKay-Lyons et al., 2020).

Gait-related outcomes showed a somewhat different profile. All three groups improved on the 10-Meter Walk Test and Timed Up and Go, in line with data indicating that structured aerobic and walking-based training can enhance gait speed and functional mobility after stroke (Gjellesvik et al., 2021; Steffen et al., 2002). However, improvements in 6-Minute Walk Test distance tended to be more pronounced in the high-intensity arms, although between-group differences did not reach statistical significance, which agrees with the notion that greater exercise intensity preferentially drives endurance-related adaptations relevant to community ambulation (Baricich et al., 2024; Sert et al., 2025). Several longer HIIT trials have reported clear between-group advantages for 6-minute walk distance and balance in favour of high-intensity protocols (Boyne et al., 2023; Gjellesvik et al., 2021). In contrast, the present study primarily demonstrated within-group gains, which can be interpreted as an early intensity signal that is likely to become more distinct once sample size and intervention duration are sufficient to detect modest between-group effects. This interpretation is consistent with methodological guidance that external pilot trials are typically underpowered for definitive comparisons on sec-

ondary functional outcomes and should be used mainly to estimate variability and refine the design of a subsequent main trial (Eldridge et al., 2016; Whitehead et al., 2016).

For the hematological variables, no meaningful changes in LDL, HDL, or triglycerides were observed over the 6-week intervention. This is in keeping with exercise lipid reviews and HIIT studies showing that clinically relevant improvements in lipid profiles generally require longer programmes and higher cumulative exercise volumes than those delivered in short trials (Mann et al., 2014). When the null lipid findings of this trial are considered alongside 8-12 week HIIT interventions that have reported modest but significant improvements in selected lipid parameters (Khammassi et al., 2018; Ouerghi et al., 2017), it appears more likely that the present intervention was under-dosed for lipid modification than that high-intensity telerehabilitation is intrinsically ineffective for this outcome. Accordingly, our data suggest that lipid management after stroke will probably require longer high-intensity programmes and/or combined aerobic resistance or lifestyle interventions rather than short, stand-alone HIIT blocks.

The present trial extends this literature by showing that remotely supervised, wearable-supported HIIT focused on lower-limb and walking tasks is feasible, can achieve intensity targets, and can approximate the cardiorespiratory and gait benefits of centre-based HIIT in ambulatory chronic stroke survivors. The use of Apple Watch-based monitoring and real-time videoconferencing enabled continuous heart-rate feedback and behavioural coaching, in line with broader rehabilitation trends that employ wearable sensors to extend supervised exercise beyond the clinic while preserving dose fidelity and safety (Moon, 2026). In settings where access to centre-based rehabilitation is limited, such a model could help address the substantial unmet need for stroke rehabilitation identified in global burden of disease analyses (Cieza et al., 2021).

V. Conclusion

Over six weeks, high-intensity interval training improved aerobic capacity and mobility in ambulatory adults with chronic stroke. With real-time monitoring, telerehabilitation achieved effects comparable to in-clinic delivery, whereas moderate-intensity training produced no meaningful cardiopulmonary gains. These findings support integrating wearable-supported HIIT into post-stroke care and warrant a larger, longer trial to confirm durability.

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