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Information and communications technology-based versus handout-based home exercise programs for heel pain syndrome: a prospective randomized study

Dong Woo Shim[1,5], Kwang Hwan ParK[1,5], Jin Woo Lee[1], Hak Jun Kim[2], Dong Hun Suh[3], Yeong Jeon[3], Ji Hun Park[3] & Gi Won Choi[3,4]✉

To compare the clinical outcomes of information and communications technology (ICT)-based home exercise programs using the exercise therapy platform (ETP™) with traditional handout-based programs for treating heel pain syndrome. Eighty-seven patients with heel pain syndrome (plantar fasciitis or Achilles tendinitis) were randomly assigned to either an ICT-based ETP™ (n = 44) or a traditional handout-based (n = 43) home exercise program. Both groups performed the same exercises for 12 weeks. Outcomes were assessed at baseline and at 4, 12, and 24 weeks using a visual analog scale (VAS) for first-step pain (primary outcome), pain at rest and during activity, foot function index (FFI), Short Form-36 (SF-36) score, and self-reported recovery. In the ETP™ group, mean improvement in VAS score for first-step pain exceeded the minimal clinically important difference (MCID) of 1.9 at all follow-up points, whereas the handout group did not achieve MCID at 4 weeks (1.4 ± 1.9). However, the mixed-effects model did not demonstrate a statistically significant between-group difference for first-step pain. For FFI, the ETP™ group showed greater improvement than the handout group at 4 weeks (between-group difference in change − 16.66, 95% confidence interval [CI] − 32.34 to − 0.99; p = 0.037; Hedges g = − 0.47) and 24 weeks (− 16.37, 95% CI − 32.04 to − 0.69; p = 0.041; g = − 0.39). For SF-36 PCS, improvement was significantly greater in the ETP™ group at 24 weeks than in the handout group (8.90, 95% CI 2.41 to 15.40; p = 0.007; g = 0.47). Self-reported recovery rates were higher in the ETP™ group at 12 and 24 weeks. In this study, both interventions improved symptoms of heel pain syndrome. Although the ETP™ group demonstrated clinically meaningful reductions in first-step pain and greater improvements in some secondary outcomes, no statistically significant between-group difference was observed for the primary outcome. These findings suggest potential benefits of ICT-based exercise therapy platforms, and further studies are needed to confirm their comparative effectiveness. Trial registration Retrospectively registered with the Clinical Research Information Services (identifier KCT0010211, registration date: 19/02/2025).

Keywords Heel pain syndrome, Plantar fasciitis, Achilles tendinitis, Home exercise, ICT, Smartphone app

Abbreviations

BMI	Body mass index
CI	Confidence interval
CONSORT	Consolidated Standards of Reporting Trials
ESWT	Extracorporeal shockwave therapy
ETP	Exercise therapy platform
FFI	Foot function index

[1]Department of Orthopaedic Surgery, Yonsei University College of Medicine, Seoul, Republic of Korea. [2]Department of Orthopaedic Surgery, Korea University Guro Hospital, Seoul, Republic of Korea. [3]Department of Orthopaedic Surgery , Korea University Ansan Hospital , Ansan-si, Republic of Korea. [4]Department of Orthopaedic Surgery, Korea University Ansan Hospital, 123, Jeokgeum-ro, Danwon-Gu, Ansan-si 15355, Gyeonggi-do, Republic of Korea. [5]These authors contributed equally: Dong Woo Shim and Kwang Hwan ParK. ✉email: barefoot@korea.ac.kr

ICT	Information and communications technology
MCID	Minimal clinically important difference
PROMs	Patient-reported outcome measures
SD	Standard deviation
SF-36 PCS & MCS	Short Form-36 physical and mental component summary
SQUASH	Short Questionnaire to Assess Health-enhancing Physical Activity
VAS	Visual analog scale

Heel pain syndrome is mainly caused by plantar fasciitis and Achilles tendinitis, and its primary treatment involves nonsurgical approaches using stretching exercises[1,2].

In clinical outpatient settings, physicians or physical therapists commonly demonstrate and explain exercise techniques to patients and provide handouts to facilitate home exercise programs[3]. Although handouts are commonly used for home exercise instruction, they present several limitations. Written materials may not fully engage patients, potentially resulting in reduced motivation and adherence to the prescribed exercise regimens. Without direct supervision, patients may misinterpret instructions, leading to improper exercise techniques, potentially compromising treatment effectiveness. Recent advancements in information and communications technology (ICT) have led to the widespread adoption of home exercise programs utilizing smartphones, mobile devices, and applications. The implementation of ICT-based home exercise programs has demonstrated notable advantages characterized by real-time feedback and monitoring capabilities, enhanced patient engagement, and improved exercise adherence[4–6]. These digital platforms provide multimedia demonstrations and progress tracking while enabling remote supervision by healthcare providers.

The delivery method of home exercise programs can influence treatment outcomes. Numerous studies have reported superior results with ICT-based home exercise programs compared to traditional paper-based materials, such as handouts and brochures[7,8]. However, some studies have identified no significant difference in outcomes between ICT-based home exercise programs and traditional methods[9,10].

Stretching exercises are considered the primary and most essential conservative treatment for heel pain syndrome[11]. The accuracy of exercise performance and exercise adherence are critical factors that significantly influence treatment outcomes[11]. Although the method of delivering exercise instructions may affect treatment results, to the best of our knowledge, no studies have compared ICT-based home exercise programs and handout-based home exercise programs for heel pain syndrome. Thus, an ICT-based exercise therapy platform (ETP™) was developed to facilitate home exercise programs for both the conservative treatment and postoperative functional rehabilitation of musculoskeletal diseases.

This study aimed to compare the clinical outcomes of ICT-based home exercise programs using the ETP™ and handout-based home exercise programs for the treatment of heel pain syndrome. This hypothesis was that ICT-based home exercise programs using the ETP™ would be more effective than traditional handout-based home exercise programs in improving heel pain syndrome.

Methods

Study design and patients

This randomized controlled study was approved by the institutional review board (2022AS0094) and registered with the Clinical Research Information Services (identifier KCT0010211). All methods were performed in accordance with relevant guidelines and regulations and adhered to the ethical principles of the Declaration of Helsinki (2013 revision). The study population comprised patients with heel pain who visited the orthopedic outpatient departments at two institutions in response to recruitment advertisements posted in hospitals and subway stations. The inclusion criteria were as follows: age between 19 and 79 years, diagnosis of plantar fasciitis or Achilles tendinitis, persistent heel pain for at least 2 weeks, and use of an Android or iOS smartphone capable of running the application for home exercise programs. The exclusion criteria were as follows: symptoms persisting for > 2 years, having received any therapeutic interventions for heel pain within the previous 3 months (medication, stretching exercises, orthoses, and/or invasive procedures), presence of inflammatory joint diseases (e.g. rheumatoid arthritis, gout, or ankylosing spondylitis), presence of acute phase symptoms, such as swelling and warmth, concurrent osteoarthritis in the ipsilateral ankle and foot, previous surgery on the ipsilateral ankle and foot, history of fracture in the ipsilateral ankle and foot, heel pain caused by trauma, concurrent tarsal tunnel syndrome, presence of tumor or infection in the ipsilateral foot, and difficulty in using smartphone applications.

A total of 87 patients ($n = 87$) were recruited from two institutions between April 2022 and February 2023 (Fig. 1). Informed consent was obtained from all the patients. The patients were randomly assigned to the ETP™ ($n = 44$) or handout ($n = 43$) groups by independent research staff using computer-based block randomization with an allocation ratio of 1:1 using block sizes of 4.

Exercise therapy platform

The ETP™ (oncoMASTER, Seoul, South Korea) consists of an integrated web platform and a synchronously connected smartphone application. The web platform contains a comprehensive database of video-based exercise programs that enables healthcare providers to create and prescribe customized exercise therapy programs for specific conditions. Patients can access their prescribed video exercise programs through a smartphone application, which allows them to perform the exercises at home.

Interventions

Initially, both groups received exercise therapy as the primary treatment. Both the groups underwent the same exercise program. Patients with plantar fasciitis performed plantar fascia-specific stretching exercises and eccentric Achilles tendon exercises, whereas those with Achilles tendinitis performed eccentric Achilles tendon

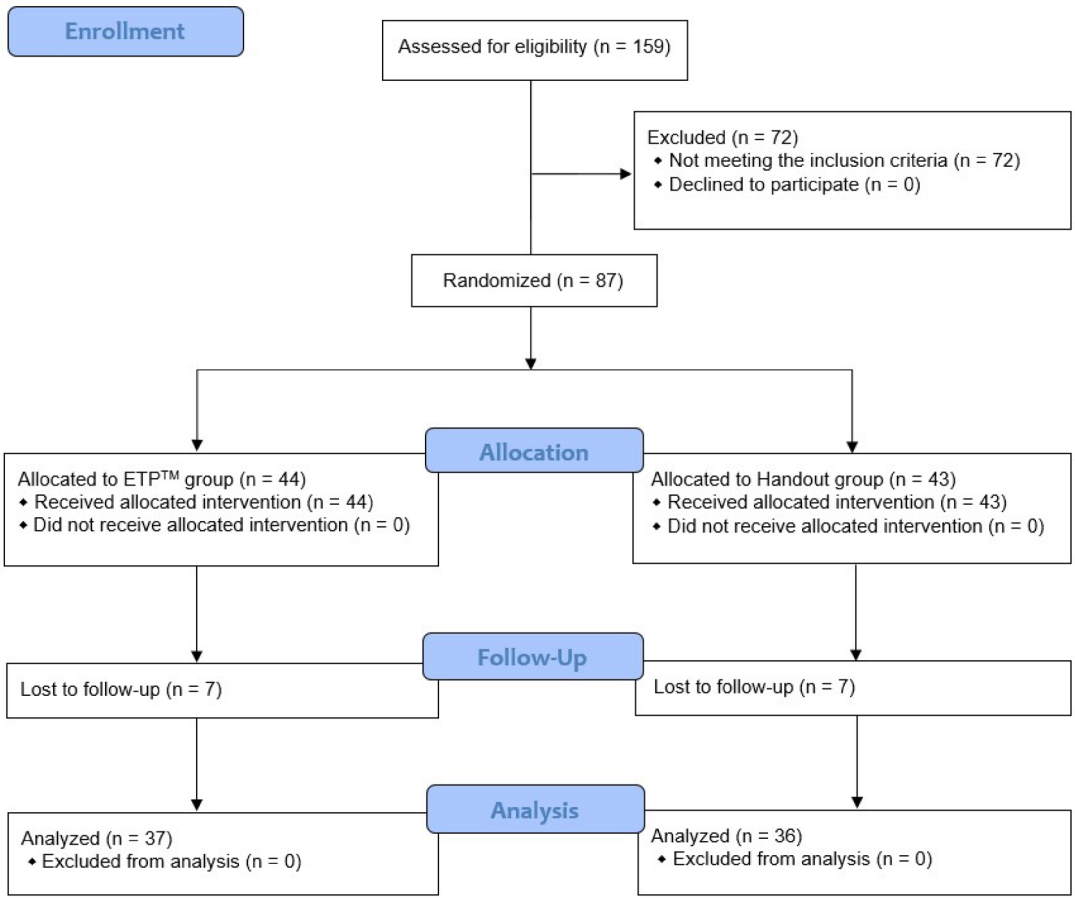

Fig. 1. Consolidated Standards of Reporting Trials (CONSORT) flow diagram. ETP™: Exercise therapy platform.

exercises. The patients were instructed to perform each exercise three times daily over a 12-week period. From the 4-week follow-up, participants who reported persistent pain and requested additional interventions were prescribed supplementary treatments, including analgesics, orthotic insoles, and extracorporeal shockwave therapy.

ETP™ group

The participants allocated to the ETP™ group were registered on the ETP™ web platform, where specific exercise programs were prescribed according to their diagnoses at baseline. Using individual QR codes displayed on the web platform, patients could install the ETP™ application on their smartphones and perform prescribed exercise programs at home while following demonstration videos (Fig. 2). These videos included narration and subtitles, providing detailed instructions on exercise methods, repetitions, and other essential parameters. The ETP™ application was set up to send regular alarms twice a week, encouraging participants to continue their exercise programs.

Handout group

Participants were provided printed instructions for the exercise programs and received both demonstration and verbal instructions from their physicians regarding exercise protocols at baseline. They were instructed to perform the exercise programs at home following the printed materials (Fig. 3).

Outcome measures

Patient-reported outcome measures (PROMs) were used to assess improvements in heel pain after exercise therapy. The participants completed the questionnaires at baseline and at 4, 12, and 24 weeks of follow-up. Outcome assessments were conducted by a researcher blinded to group allocation. At baseline, information on demographics, including the activity score based on the Short Questionnaire to Assess Health-enhancing Physical Activity (SQUASH) questionnaire, was gathered[12]. The primary outcome was first-step pain on an 11-point visual analog scale (VAS) (0, no pain; 10, worst pain) at the 24-week follow-up. The secondary outcomes included VAS scores for pain at rest and during activity, foot function index (FFI) questionnaire[13], quality of life according to the Short Form-36 (SF-36) questionnaire[14], and self-reported recovery on a 7-point Likert scale[15](lower score indicates less recovery). Recovery was defined as participants who reported being

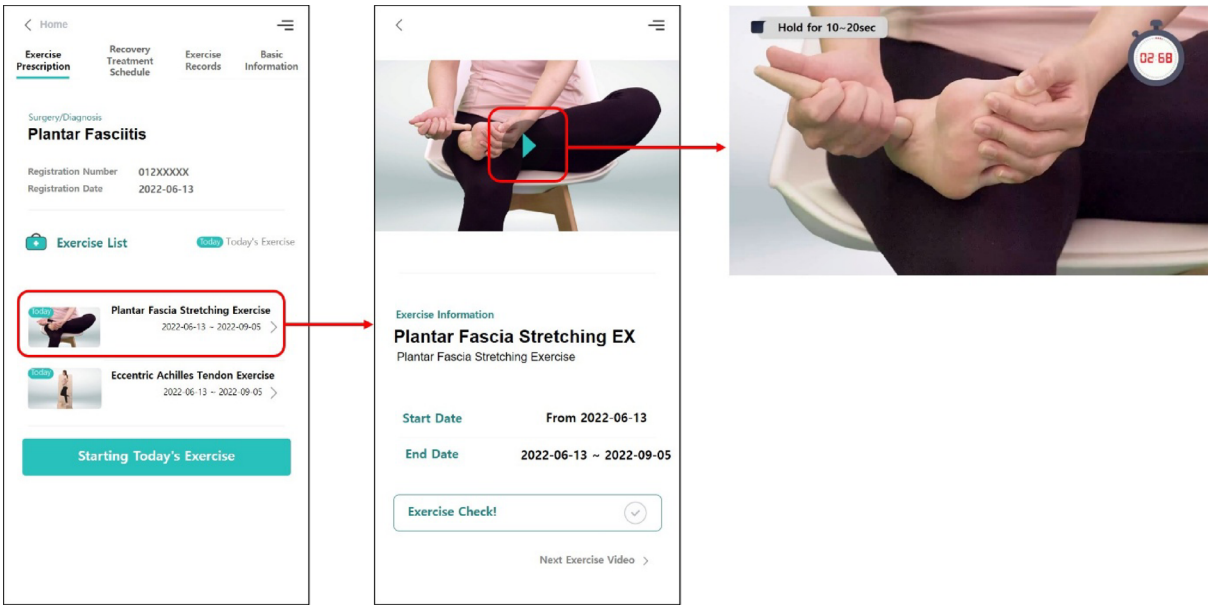

Fig. 2. Smartphone application of the exercise therapy platform™.

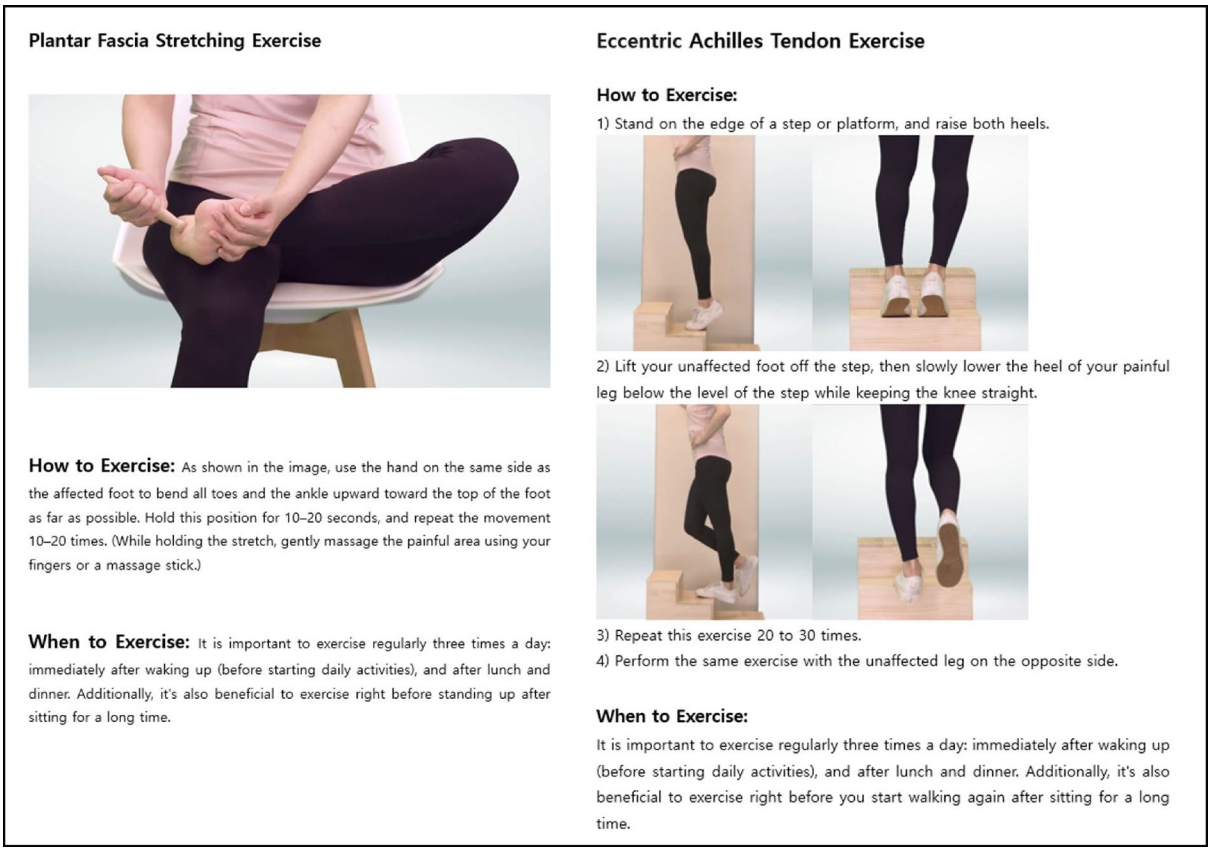

Fig. 3. Handout for exercise programs.

either 'completely recovered' (7 points) or 'mostly recovered' (6 points)[16]. At each follow-up visit, any additional treatments utilized besides exercise therapy were documented.

Statistical analysis

The primary sample size for the study was calculated based on the VAS score for pain reported in a previous study[17]. Group sample sizes of 26 and 26 achieve 91.139% power to reject the null hypothesis of equal means when the population mean difference is μ1 − μ2 = 1.3–3.8 = − 2.5 with standard deviations of 1.3 for group 1 and 3.5 for group 2, and with a significance level (alpha) of 0.05 using a two-sided two-sample unequal-variance t-test. After adjusting the sample size to a dropout rate of 20%, the sample size was 33 in each group.

Additionally, a secondary sample size calculation was performed a priori based on the VAS score for first-step pain, with a minimal clinically important difference (MCID) of 1.9. A sample size of 7 achieves 94% power to detect a mean of paired differences of −3.75 ($H_0 : \bar{d} (= -5.65) = -1.9$ vs. $H_1 : \bar{d} (= -5.65) \neq -1.9$) with an estimated standard deviation of paired differences of 2.31797 and a significance level (alpha) of 0.05 using a two-sided paired t-test. Here, $\bar{d}$ represents the average of the differences between baseline and 24 weeks. Assuming a dropout rate of 20%, the required sample size was nine patients per group. Thus, our recruitment target of 33 participants per group was sufficiently robust to detect statistical and clinical differences. Sample size was calculated using the PASS 2021 Power Analysis and Sample Size Software (2021, NCSS, LLC. Kaysville, Utah, USA).

The analyses were conducted using linear mixed-effects models including participants who completed the study and had available outcome data, consistent with a per-protocol analytical approach. All continuous data were tested for normal distribution using the Kolmogorov–Smirnov test. Student's t-test or Mann–Whitney U test was used to compare continuous variables between groups. Categorical variables were compared using the chi-square test or Fisher's exact test. As the outcomes were assessed repeatedly over time, longitudinal analyses were performed using linear mixed-effects models to account for within-subject correlations. The models included a random intercept for participants and fixed effects for group, time, and group × time interactions. Group ×time interaction terms were used to estimate between-group differences in change from baseline at each follow-up time point, and the results are reported as estimated mean differences with 95% confidence intervals (CIs). Standardized effect sizes (Hedges' g) were calculated for between-group differences in change scores at each follow-up.

Statistical significance was set at $p < 0.05$. Statistical analyses were performed using IBM SPSS Statistics for Windows version 25 (IBM).

Results

Of the 159 participants screened for eligibility, 87 were enrolled. A total of 73 patients were included in the analysis, with a follow-up loss of seven patients per group (Fig. 1). Baseline demographics and characteristics are summarized in Table 1.

Patient-reported outcomes over time are summarized in Table 2. In the ETP™ group, the mean improvement in VAS score for first step pain exceeded the MCID of 1.9 at all follow-up time points. However, in the handout group, the mean improvement was 1.4 ± 1.9 at the 4 weeks follow-up, which was below the MCID of 1.9. Figure 4 shows the percentage of patients in each group who achieved a mean improvement in the VAS score for first-step pain, exceeding the MCID of 1.9.

For FFI, the ETP™ group showed greater improvement than the handout group at 4 weeks (between-group difference in change − 16.66, 95% CI − 32.34 to − 0.99; $p = 0.037$; Hedges g = − 0.47) and 24 weeks (− 16.37, 95% CI − 32.04 to − 0.69; $p = 0.041$; g = − 0.39). For SF-36 PCS, improvement was significantly greater in the ETP™ group at 24 weeks than in the handout group (8.90, 95% CI 2.41 to 15.40; $p = 0.007$; g = 0.47). Group differences in changes were not statistically significant for the VAS outcomes (first-step pain, rest, and activity) or SF-36 MCS at any follow-up time point. The ETP™ group demonstrated greater mean improvements in all PROMs compared to the handout group across all follow-up periods, with the exception of VAS score for first-step pain at the 12-week follow-up.

The percentages of participants reporting recovery and the corresponding odds ratios for recovery are presented in Table 3. The additional treatments administered during the follow-up period are listed in Table 4. During the entire follow-up period, additional treatments were performed in 18.9% ($n = 7$) of the ETP™ group and 22.2% ($n = 8$) of the handout group ($p = 0.727$).

Discussion

The ICT-based ETP™ may offer tangible advantages over traditional handout-based exercise programs for individuals with heel pain syndrome. Patients in the ETP™ group demonstrated clinically meaningful improvements in patient-reported outcomes, and the mean reduction in first-step pain consistently exceeded the MCID of 1.9 within the group. However, the mixed-effects model did not reveal a statistically significant between-group difference for the primary outcome of first-step pain. Therefore, these findings should be interpreted as evidence of clinically meaningful improvement within the ETP™ group rather than definitive superiority over the handout-based program. Notably, the ETP™ group showed significantly greater improvements in secondary outcomes, including the FFI and SF-36 PCS. Furthermore, self-reported recovery rates were higher in the ETP™ group. Thus, our hypothesis that ICT-based home exercise programs using the ETP™ would be more effective than traditional handout-based programs in improving heel pain syndrome is largely supported.

These findings align with those of a growing body of literature supporting the use of ICT-based interventions for home exercise programs[3–5]. Several studies have demonstrated that ICT-based programs are superior to

	ETP™ (*n* = 37)	Handout (*n* = 36)	*p*
Age* (years)	52.4 (10.5)	54.8 (9.2)	0.310†
Sex *(no. [%])*			0.562‡
Men	7 (18.9%)	5 (13.9%)	
Women	30 (81.1%)	31(86.1%)	
BMI* *(kg/m^2)*	24.8 (4.0)	24.3 (3.9)	0.541†
Duration of symptoms* (weeks)	31.2 (24.6)	32.6 (27.1)	0.822†
Diagnosis *(no. [%])*			> 0.999§
Plantar fasciitis	28 (75.7)	29 (80.6)	
Achilles tendinitis	7 (18.9)	6 (16.7)	
Both of these	2 (5.4)	1 (2.8)	
Activity level*			
SQUASH	4623.8 (3356.5)	5285.1(4035.3)	0.448†
Previous treatment *(no. [%])*			
No previous treatment	20 (54.1%)	26 (72.2%)	0.108‡
Pain medication	9 (24.3%)	5 (13.9%)	0.258‡
Stretching	4 (10.8%)	3 (8.3%)	0.999§
ESWT	10 (27.0%)	4 (11.1%)	0.136§
Custom insoles	1 (2.7%)	2 (5.6%)	0.615§
Corticosteroid injection	4 (10.8%)	1 (2.8%)	0.358§

Table 1. Baseline characteristics of participants. *The data are presented as mean (standard deviations). †Student's t-test, ‡Chi-square test, §Fisher's exact test. *BMI* Body mass index, *SQUASH* Short Questionnaire to Assess Health-enhancing physical activity, *ESWT* Extracorporeal shockwave therapy.

traditional paper-based materials, such as handouts and brochures, owing to their real-time feedback, enhanced engagement, and improved adherence rates[18–20]. Our study extends this evidence by specifically examining heel pain syndrome and highlighting the potential utility of an ETP™ in this population. Patients in the ETP™ group experienced quicker pain relief and maintained higher motivation levels than those in the handout group, highlighting the importance of dynamic feedback, multimedia support, and thorough instruction in successful home-based rehabilitation. Although the hand-out group also reported improvements, their progress was slower, underscoring the significance of continuous guidance. The importance of such guidance is consistent with broader research indicating that digital health tools promote higher levels of patient engagement and adherence, ultimately resulting in superior clinical outcomes in various musculoskeletal and orthopedic conditions[21,22].

From a neuroscientific perspective, the enhanced efficacy of ICT-based interventions may be partially explained by the principles of motor learning and neuroplasticity[23]. Unlike static paper handouts, the ETP™ provides continuous visual cues and digital feedback, which are crucial for error-based motor learning and sensory-motor integration[24]. This dynamic guidance helps patients accurately correct their proprioception and refine their movement patterns during eccentric loading and fascial stretching. Furthermore, guided repetition facilitated by the application promotes neuroplasticity, strengthening the specific neural pathways required to automate correct motor behaviors[23]. By continuously reinforcing proper biomechanics and providing structured cues, the ICT platform not only optimizes physical tissue offloading but also positively modulates adherence behavior through neurological habit formation[25], ultimately leading to superior clinical outcomes.

However, some studies have reported no significant differences in outcomes between ICT-based and traditional methods[19,26,27]. This discrepancy may be attributed to variations in the design of ICT interventions, specific populations studied, and the outcome measures used. Our study utilized a comprehensive ETP™ that provided video-based exercise programs and detailed instructions, which may have contributed to its effectiveness.

The strengths of our study include its randomized, controlled design, which minimized selection bias and reduced confounding effects. The inclusion of a diverse range of PROMs, including VAS score for pain, FFI, and SF-36, provided a comprehensive assessment of treatment outcomes. The use of MCID values is clinically relevant to these findings.

However, our study has some limitations. First, the follow-up period was limited to 24 weeks, which may not have been sufficient for assessing the long-term effects of the intervention. Second, although both groups received the same stretching exercises as the primary treatment, the supplementary treatments prescribed from the 4-week follow-up were not standardized, which may have influenced the results. Third, the analyses were conducted using a per-protocol approach rather than a strict intention-to-treat framework because participants who withdrew from the study were not included in the final analysis. This may introduce potential bias and limit the robustness of the findings. Fourth, although physical activity was assessed at baseline using the SQUASH questionnaire, it was not controlled during the study period. Fifth, we did not objectively quantify patient adherence to the home exercise program in either group because of the lack of tracking features in the current ETP™ platform. Although the better clinical outcomes in the ETP™ group compared to that in the handout group

Outcome	Time	ETP™ ($n=37$) Mean (SD)	Handout ($n=36$) Mean (SD)	Between-group difference in change from baseline* (95% CI)	p	Effect size (Hedges g†)
VAS first-step pain	Baseline	6.76 (2.18)	6.39 (2.32)			
	4 weeks	4.81 (2.45)	5.03 (2.25)	−0.58 (− 1.65 to 0.48)	0.282	−0.28
	12 weeks	3.51 (1.89)	2.89 (2.04)	0.26 (− 0.81 to 1.32)	0.637	0.11
	24 weeks	1.76 (1.77)	2.19 (1.65)	−0.81 (− 1.87 to 0.26)	0.138	−0.29
VAS during rest	Baseline	3.41 (2.28)	3.08 (2.44)			
	4 weeks	2.65 (1.86)	2.72 (1.91)	−0.40 (− 1.42 to 0.63)	0.448	−0.15
	12 weeks	1.62 (1.59)	1.44 (1.52)	−0.14 (− 1.17 to 0.88)	0.781	−0.06
	24 weeks	0.89 (1.41)	1.22 (1.77)	−0.65 (− 1.67 to 0.37)	0.210	−0.24
VAS during activity	Baseline	6.00 (1.84)	5.75 (1.98)			
	4 weeks	4.11 (2.13)	4.14 (1.68)	−0.28 (− 1.23 to 0.67)	0.563	−0.12
	12 weeks	3.03 (1.76)	2.92 (1.98)	−0.14 (− 1.09 to 0.81)	0.773	−0.06
	24 weeks	1.84 (1.48)	2.17 (1.93)	−0.58 (− 1.53 to 0.37)	0.233	−0.25
FFI	Baseline	104.78 (35.02)	94.61 (40.17)			
	4 weeks	69.59 (31.18)	76.08 (31.49)	−16.66 (− 32.34 to − 0.99)	0.037	−0.47
	12 weeks	47.86 (30.80)	45.19 (27.87)	−7.50 (− 23.18 to 8.17)	0.348	−0.20
	24 weeks	29.03 (25.92)	35.22 (40.07)	−16.37 (− 32.04 to − 0.69)	0.041	−0.39
SF-36 PCS	Baseline	52.97 (17.69)	60.48 (16.83)			
	4 weeks	63.92 (14.22)	66.53 (13.06)	4.90 (− 1.59 to 11.40)	0.139	0.38
	12 weeks	67.57 (15.31)	70.14 (14.36)	4.94 (− 1.55 to 11.44)	0.136	0.32
	24 weeks	73.80 (15.05)	72.41 (18.73)	8.90 (2.41 to 15.40)	0.007	0.47
SF-36 MCS	Baseline	63.49 (16.95)	67.51 (13.41)			
	4 weeks	70.44 (14.07)	70.68 (14.27)	3.78 (− 2.67 to 10.23)	0.251	0.32
	12 weeks	74.26 (14.65)	73.68 (13.97)	4.60 (− 1.84 to 11.05)	0.162	0.30
	24 weeks	72.07 (16.93)	75.78 (16.44)	0.31 (− 6.14 to 6.76)	0.925	0.02

Table 2. Patient-reported outcomes over time and between-group differences. *Between-group differences represent the additional change in the ETP™ group relative to the handout group at each follow-up compared with baseline, estimated from a linear mixed-effects model with fixed effects for group, time, and group×time interaction and a random intercept for participants. †Hedges g is calculated for between-group differences in change scores. *SD* Standard deviation, *CI* confidence interval, *VAS V*isual analog scale, *FFI* Foot function index, *SF-36 PCS & MCS* Short Form-36 physical and mental component summary.

suggest effective engagement, future studies incorporating real-time monitoring data are needed to precisely evaluate the relationship between adherence and clinical outcomes. Finally, the study did not include a cost-effectiveness analysis, which would be valuable for informing clinical decision making and resource allocation.

Since exercise accuracy and adherence are critical factors influencing treatment outcomes, complex exercise programs delivered through handouts for home exercises may result in reduced therapeutic effects owing to patients' potential misunderstanding of the exercise methods. Exercise programs for postoperative care following chronic ankle instability or Achilles tendon rupture surgery involve more diverse types of exercises than those used for heel pain syndrome, and the timing of exercise initiation varies depending on the exercise type. Therefore, it may be challenging for patients to comprehend exercise methods accurately solely through handouts. The ETP™ allows surgeons to customize exercise programs by selecting specific exercises for individual patients and determining the initiation and termination periods for each exercise. Patients can perform exercises at home while watching videos of their prescribed exercise program through the application, which enables more accurate exercise execution than handouts. Consequently, the difference in therapeutic effects between ETP™-based and handout-based home exercises may become more evident in complex exercise programs. Therefore, further research is required to evaluate the effectiveness of ETP™-based exercise therapy in other conditions that require complex exercise programs, such as postoperative rehabilitation for chronic ankle instability or Achilles tendon rupture surgery.

Conclusion

In this randomized controlled trial, both interventions improved symptoms of heel pain syndrome. Although the ETP™ group demonstrated clinically meaningful reductions in first-step pain and greater improvements in some secondary outcomes, the primary outcome did not show a statistically significant between-group difference. These findings suggest that ICT-based exercise therapy platforms may provide clinically meaningful benefits and improve patient-reported outcomes, but further studies are needed to confirm their comparative effectiveness over traditional handout-based exercise programs.

Data availability

The data supporting this study's findings are available from the corresponding author upon reasonable request.

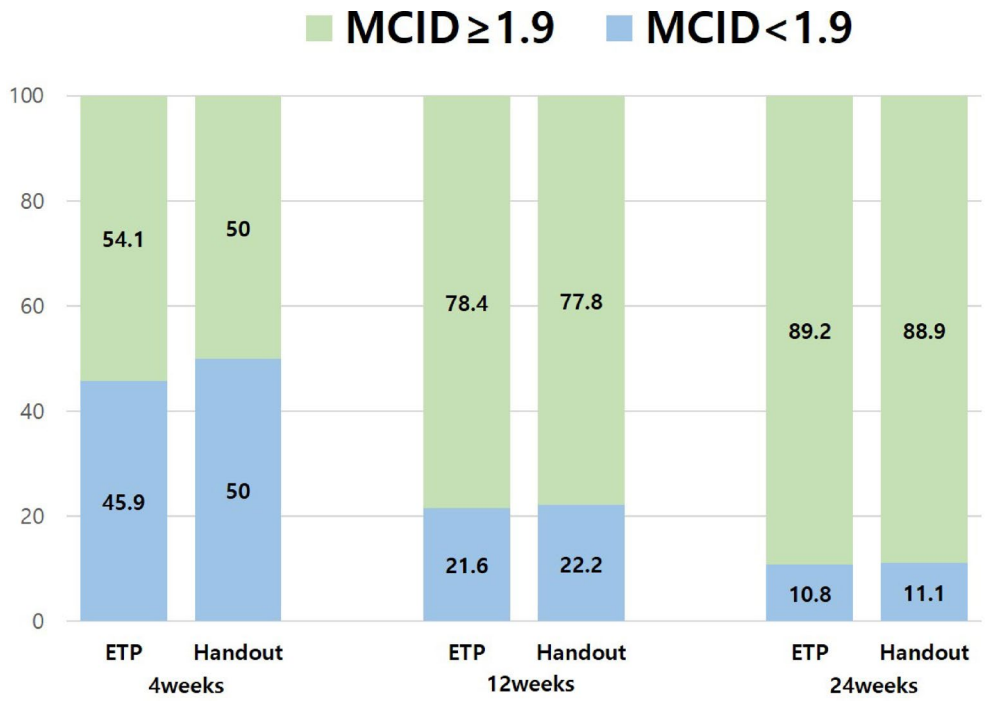

Fig. 4. Percentage of patients who achieved mean improvement in visual analog scale for first-step pain exceeding the MCID of 1.9. MCID: Minimal clinically important difference.

Follow-up point	ETP™ ($n=37$)	Handout ($n=36$)	Odds ratios (95% CI)
4 weeks *(no. [%])*	4 (10.8%)	4 (11.1%)	0.97 (0.22 to 4.21)
12 weeks *(no. [%])*	17 (45.9%)	13 (36.1%)	1.5 (0.28 to 3.84)
24 weeks *(no. [%])*	25 (67.6%)	19 (52.8%)	1.8 (0.72 to 4.81)

Table 3. Proportion of participants reporting completely/mostly recovered status and corresponding odds ratios. *CI* Confidence interval.

Follow-up point	ETP™ ($n=37$)	Handout ($n=36$)	*p*
4 weeks *(no. [%])*			
No treatment	30 (81.1%)	29 (80.6%)	0.995*
Pain medication	2 (5.4%)	2 (5.6%)	0.999†
ESWT	4 (10.8%)	6 (16.7%)	0.515†
Custom insoles	1 (2.7%)	–	0.999†
12 weeks *(no. [%])*			
No treatment	34 (91.9%)	33 (91.7%)	0.999†
Pain medication	2 (5.4%)	1 (2.8%)	0.999†
ESWT	2 (5.4%)	3 (8.3%)	0.674†
Custom insoles	–	1 (2.8%)	0.493†
24 weeks *(no. [%])*			
No treatment	36 (97.3%)	35 (97.2%)	0.999†
Pain medication	1 (2.7%)	1 (2.8%)	0.999†
ESWT	–	–	
Custom insoles	–	–	

Table 4. Additional treatment. *Chi-square test, †Fisher's exact test. *ESWT* Extracorporeal shockwave therapy.

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Author contributions

Choi GW: Study design, Investigation, Supervision, Conceptualization, FundingShim DW, Park KH: Original draft preparation, InvestigationLee JW, Kim HJ: Draft Reviewing and EditingSuh DH, Jeon Y, Park JH: Data curation, Analyzing and Interpreting.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

This study was approved by the Institutional Review Board (IRB) of Korea University Ansan Hospital (IRB No.: 2022AS0094), and all participants provided written informed consent.

Consent for publication

All the patients in this study have given their informed consent for the article to be published.

Additional information

Correspondence and requests for materials should be addressed to G.W.C.

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