Home-Based Physical Therapy Intervention With Adherence-Enhancing Strategies Versus Clinic-Based Management for Patients With Ankle Sprains

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Background and Purpose

To some extent, favorable treatment outcomes for physical therapy intervention programs depend on patients attending their clinic appointments and adhering to the program requirements. Previous studies have found less-than-optimal levels of clinic attendance, and a viable option might be physical therapy intervention programs with a large component of home treatment. This study investigated the effects of a standard physical therapy intervention program—delivered primarily at either the clinic or home—on ankle function, rehabilitation adherence, and motivation in patients with ankle sprains.

Subjects

Forty-seven people with acute ankle sprains who were about to start a course of physical therapy intervention participated in the study.

Methods

Using a prospective design, subjects were randomly assigned to either a clinic intervention group or a home intervention group. Ankle function and motivation were measured before and after rehabilitation, and adherence to the clinic- and home-based programs was measured throughout the study.

Results

The groups had similar scores for post-treatment ankle function, adherence, and motivation. The home intervention group had a significantly higher percentage of attendance at clinic appointments and better physical therapy intervention program completion rate.

Discussion and Conclusion

Home-based physical therapy intervention appears to be a viable option for patients with sprained ankles.

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It is recognized that favorable treatment outcomes for physical therapy interventions depend, to some extent, on patients attending their clinic appointments and adhering to the program requirements.[1] Attendance at physical therapy outpatient clinics, however, is not optimal: between 5.8% and 14.3% of patients fail to attend either their first physical therapy clinic appointment or follow-up appointments.[2,3] The main reasons given for not attending physical therapy appointments were problems with getting time off from work or class, finding suitable short-term child care, treatment expenses, and transportation to and from the clinic.

In an attempt to overcome these reasons for poor clinic attendance, the use of home-based treatment programs has been advocated for both acute and chronic injuries or disorders. Investigations that have compared clinic- and home-based treatment for patients with acute injuries or disorders are relevant to this study. No significant differences in physical function were found between these 2 methods of delivering rehabilitation following arthroscopic orthopedic surgery[4–6] and following acute injuries.[7]

Although concerns have been expressed about patients' ability to implement home-based treatment for acute injuries safely, the findings of a study by Symons et al[7] indicate that these concerns are unfounded. There are 2 problems, however, in generalizing the findings of these studies[4–7] to the use of home-based physical therapy for patients with acute injuries. First, the rehabilitation protocols following arthroscopic surgery are based on the known rate of tissue healing, whereas the healing rates of soft tissue injuries are not always so predictable.[8] Second, Symons et al[7] compared home- and clinic-based care for children with radial greenstick fractures up until the removal of the plaster cast, and their study did not involve physical therapy intervention.

Although home-based physical therapy intervention appears to be the logical method of overcoming problems with attendance, adherence to home programs used to supplement clinic-centered physical therapy intervention has been found to be poor: between 60% and 76% of patients did not adhere fully to the treatment requirements.[9,10] Nonetheless, adherence can be improved by the using suitable cognitive-behavioral and patient education techniques as treatment adjuncts. Cognitive-behavioral techniques that have been found to be valuable are goal setting,[11–13] individualized action plans,[13] and cue cards.[14] Educational methods shown to have merit are booklets, videos, and verbal advice that provide information about the disorder, its treatment, and ways of overcoming barriers to treatment adherence.[13–15] For such information to be of the most value in terms of understanding and adherence to treatment requirements, however, it needs to be: (1) presented in simple, everyday language, (2) meaningful to the patients, and (3) tailored to suit their needs.[16]

Currently, there do not appear to be any well-controlled experimental studies that have investigated the effects of a standard physical therapy intervention program based either at the clinic or at home on treatment outcomes, rehabilitation adherence, and motivation for patients with nonsurgically treated acute injuries. Therefore, the aim of this study was to compare the effects of a standard physical therapy intervention program that was conducted primarily at either the clinic or home for patients with acute ankle sprains. We hypothesized that there would be no significant difference between the outcomes of the 2 methods of delivering the physical therapy intervention on post-treatment ankle function, the levels of treatment adherence, and motivation to undertake the treatment.

We chose ankle sprains as the injury of focus because they are a very common injury (making up 15%–20% of all sports injuries), most patients recover within 4 to 6 weeks of the injury, and they are commonly treated using a standard 3-phase physical therapy intervention protocol.[17]

Method

Subjects

Fifty-two people diagnosed with an acute ankle sprain (first-time or recurrent) were selected from 4 physical therapy clinics in middle to low socioeconomic suburbs. Forty-seven of these people met the inclusion criteria and were willing to take part in the study. The sole exclusion criterion was a poor command of the English language that could impede understanding of the intervention information and the questionnaires. The calculation of the sample size was based on the Cohen effect sizes[18] of previous studies[11,19,20] that investigated the main variables of interest (ie, adherence and rehabilitation outcomes). The calculation indicated that a sample of 44 subjects, 22 in each group, was needed to provide a power of .80 to detect a large effect size ($d>.7$) with the alpha level set at .05. A sample of 47 subjects was recruited, and 3 subjects were lost during the study. The Figure shows the progression of subjects through the study.

Measures

Demographic characteristics. The subjects' age, sex, level of involvement in sports and physical activity, and previous history of injury and physical therapy treatment were

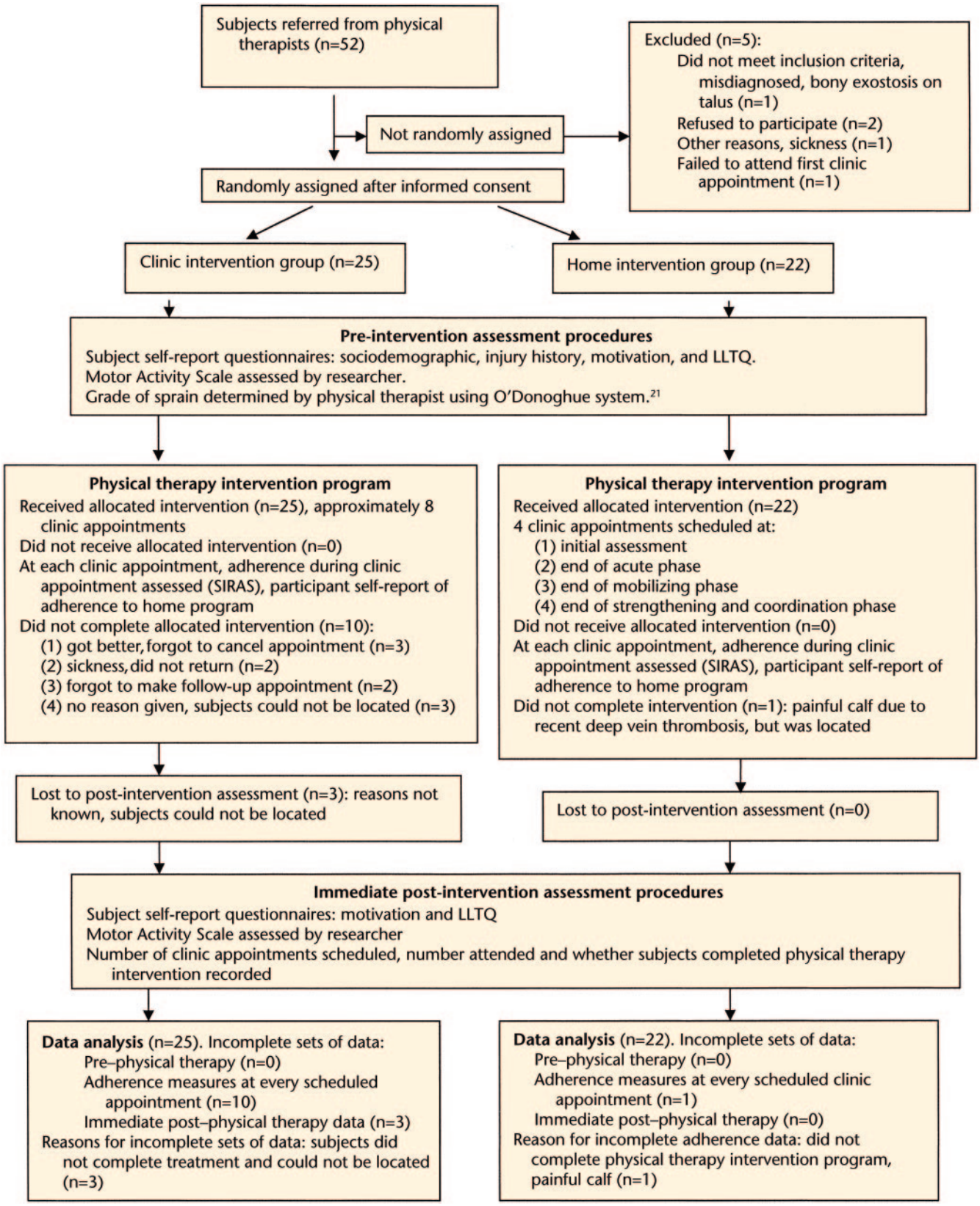

Figure.
Flow chart describing the progress of subjects through the study and course of physical therapy intervention. LLTQ=Lower Limb Task Questionnaire, SIRAS=Sport Injury Rehabilitation Adherence Scale.

recorded. Distance from the clinic to home (in kilometers) and reasons for choosing the clinic also were recorded. The ankle sprain characteristics assessed were: (1) whether the injury was first-time or recurrent, (2) the date the injury was sustained, (3) the cause of injury, and (4) the injury's severity graded according to the O'Donoghue[21] system. The level of pain at the time of the injury was assessed using a box plot. An 11-point box plot was used in preference to a visual analog scale, because we considered it to be more reliable for transposition of scores in the data entry phase of the study.

Ankle function. The Lower Limb Task Questionnaire (LLTQ)[22] and the Motor Activity Scale[23] measured ankle function. The LLTQ is a self-report questionnaire consisting of 2 subscales. The 10-item recreational activity scale measures strenuous activities most likely to be undertaken in sports such as running, jumping, and cutting; the 8-item activities of daily living (ADL) scale assesses less demanding activities such as walking, getting up from a chair, and carrying groceries. Subjects score each activity on a 5-point scale (0=no difficulty, 4=unable). The 2 subscales have proven reliability (recreational activity scale α=.96, ADL scale=.89).[22] The Motor Activity Scale[23] measures motor performance on 6 activities that involve running, walking, and hopping over specified distances and uses a dichotomous scoring system (0=task was not completed, 1=task was successfully completed). This scale has proven reliability (α=.90) and is sensitive to change over time (P=.001).[23]

Adherence. *Adherence* was defined as the extent to which the subjects followed the clinic- and home-based components of their physical therapy intervention. In line with previous rehabilitation adherence research and to accommodate the diverse behaviors required for adherence, a multifaceted approach was taken to measure adherence.[1] First, attendance at clinic appointments was measured by the percentage of attendance (calculated by dividing the number of appointments attended by the number scheduled and multiplying by 100). In addition, the number of subjects who completed their physical therapy intervention program by attending their final scheduled clinic appointment was recorded.[2]

Second, adherence to the physical therapy modalities given during the clinic appointment was assessed by the physical therapists at the end of the treatment using the Sport Injury Rehabilitation Adherence Scale (SIRAS).[24] The SIRAS is a 3-item instrument that uses a 5-point scale to assess the intensity with which patients complete their exercises, the extent to which they follow their practitioner's advice and instructions during the treatment, and their receptiveness to changes made during the rehabilitation session. It has acceptable internal consistency (α=.82), test-retest reliability (intraclass correlation coefficient=.77), and interrater reliability (intraclass correlation coefficient=.53).[19]

Third, subject self-reports of adherence to the physical therapy modalities undertaken at home were obtained. The scale listed the 5 modalities of treatment, namely exercises, ice, refraining from undertaking activities considered detrimental to recovery, strapping or bracing of the ankle, and resting with the ankle in elevation. At the beginning of each clinic appointment, subjects rated the extent of their adherence (1=none, 5=all) to those modalities prescribed since their last appointment, and they circled "not applicable" for those modalities not prescribed. All subjects, regardless of their intervention grouping, were assessed on all the measures of attendance and adherence to the treatment program.

Motivation for the physical therapy intervention. The 4-item identified regulation subscale from the Situational Motivational Scale[25] assessed the subjects' motivation toward undertaking the physical therapy intervention. This subscale was chosen because it measures a person's beliefs about undertaking an activity for its beneficial effects. In response to the question "Why are you starting physical therapy?," subjects rated the reasons given on a 7-point Likert scale (1=corresponds not at all, 7=corresponds exactly). The 4 reasons were: "Because I am doing it for my own good," "Because the physical therapy will be good for me," "By personal decision," and "Because I believe the physical therapy is important to me." This subscale has proven reliability (α=.80).[25]

Physical Therapy Intervention Program

All subjects were prescribed the same progressive 3-phase physical therapy intervention protocol outlined in Table 1, which was progressed on the basis of the severity of the sprain and their recovery from symptoms.[26–28] Following discharge from physical therapy intervention, the subjects were advised to continue with strengthening and balancing activities so as to maintain the integrity of their ankle. In New Zealand, patients with ankle sprains who are referred for physical therapy intervention are initially funded for a maximum of 10 clinic treatments.[26]

Clinic-based intervention. Subjects in this intervention group were scheduled appointments according to the severity of their sprain, their rate of recovery, and their ultimate need for treatment. During these ap-

Table 1.
Standard Physical Therapy Program

Treatment Phase and Approximate Duration	Physical Therapy Modalities	Progression of Modalities	Indicators for Progressing to the Next Treatment Phase
Acute (36–48 hours following injury)	Refrain from activity detrimental to their recovery. Two hourly application of ice. Compression (bandage or Tubigrip[a]) to the foot, ankle and leg. Ankle strapped.	As the swelling and bruising decreased, the application of ice and the time spent with the limb in elevation was decreased. Ankle strapping maintained throughout this phase.	When the edema and acute pain had subsided.
	Resting with the injured limb elevated. Gentle free active ankle movements within the limits of pain.	As the pain decreased, the free active movements were progressed by increasing the range and frequency of movement and the number of repetitions of each movement.	
Mobilizing (10–14 days)	Mobilizing exercises for the foot and ankle: plantar flexion and dorsiflexion, inversion and eversion.	Mobilizing exercises progressed by increasing the range of movement, adding holds at the end of the range of movement, and increasing the duration of the holds.	When the subjects could cope with gentle resistance and, while standing, could tolerate equal weight through their lower limbs.
	Gentle strengthening exercises, such as pushing against a wall for eversion, using the other foot as a resistance for dorsiflexion, and scrunching a towel under the sole of the foot for the intrinsic foot muscles.	Strengthening exercises were added when subjects could easily undertake the mobilizing exercises. These exercises were progressed by increasing the length of time for the holds at the end of the range of movement.	
	Calf and heel stretches.	Stretches started in sitting and progressed to standing when subjects could maintain the standing position. Duration of the stretch increased.	
	Ankle strapping/taping	Ankle kept strapped during this phase and only removed 12 hours before each clinic appointment to assess ankle stability.	

(*continued*)

pointments, the subjects undertook the physical therapy intervention program, with the physical therapist spending time treating their symptoms and supervising the activities and exercises. Subjects also were prescribed a small home program of no more than 4 simple activities, which was designed to supplement the clinic treatment, not replace it. No standard written or verbal information was used to educate subjects about their injury and physical therapy intervention. Instead, the physical therapists decided which educational and cognitive behavioral techniques to use, and these techniques mostly depended on the severity of each subject's sprain, his or her rate of recovery, and his or her

Table 1.
Continued

Treatment Phase and Approximate Duration	Physical Therapy Modalities	Progression of Modalities	Indicators for Progressing to the Next Treatment Phase
Strengthening (approximately 10–14 days)	Thera-Band[b] resistance bands for eversion and dorsiflexion.	Increased range of movement, the length of the holds at the end of the range of movement, and the strength level of the Thera-Band.	Subjects discharged from physical therapy intervention once they had obtained full ankle function and were able to cope with their daily activities.
	Body-weight resistance in standing. Heel-raises and standing on the injured limb, while holding onto a stable support.	Increased time spent in the weight-bearing position and decreased amount of support provided by the rail.	
	One-leg standing on the injured limb, with arms abducted and eyes open.	Increased the amount of time standing on the injured limb, changed arm position from abducted to beside the body to folded across the chest. Eyes open to eyes closed.	
	Standing on balance/wobble board with eyes open.	Decreased standing base, throwing and catching a ball, standing on the injured limb, eyes open to eyes closed.	
	Weight-bearing activities: walking, running, skipping, and hopping.	Progressed from walking to running to skipping and hopping. Increased duration of time spent on each activity.	
	Ankle strapping	As ankle stability improved, the ankle was strapped only during strenuous activity.	

[a] Medlock Medical, Tubiton House, Medlock Street, Oldham OL13H5, United Kingdom.
[b] The Hygenic Corp, 1245 Home Ave, Akron, OH 44310-2575.

ability to understand and adhere to the treatment program.

Home-based intervention. Subjects were scheduled clinic appointments that coincided with the transition from one phase to another. During these appointments, minimal, if any, treatment of symptoms was given. Instead, the physical therapists spent the time teaching the subjects about the application of the prescribed treatment modalities to be undertaken at home during the next treatment phase and the indicators for progressing or modifying them. To guard against the possibility of poor adherence that has been associated with home-based physical therapy intervention programs, the subjects were given educational and cognitive-behavioral adjuncts to help them implement the physical therapy intervention. These included a treatment booklet and equipment such as strapping tape, Tubigrip* for compression, Thera-Band resistance bands,† and wobble boards.

The booklet contained information about the structure of the ankle; ankle sprains; the modalities for the 3 treatment phases and their method of progression; diary grids; progress sheets; and adherence-enhancing strategies, such as cues, reminders, relapse prevention methods, and treatment goals. The information was written in simple, everyday language, illustrated with pictures and diagrams, and it could be tailored to suit the subjects' rate of recovery. Subjects also were given pocket-size laminated cue cards as treatment reminders and instructed to put the cue cards in noticeable places such as their pocket or bedside table.

Procedure

Prior to the commencement of the study, physical therapists were given information about the study and the measures. When patients who met the inclusion criteria made their first physical therapy treatment appoint-

* Medlock Medical, Tubiton House, Medlock Street, Oldham OL13H5, United Kingdom.
† The Hygenic Corp, 1245 Home Ave, Akron, OH 44310-2575.

ment, they were approached by clinic staff to take part in the study. Those who volunteered signed a consent form and were randomly assigned to either the clinic intervention group or the home intervention group by way of a computer-generated list. The Figure shows the timing of the measures, the sequential flow of the study procedures, and the progression of subjects through the study.

Data Analysis

The dependent variables were ankle function, adherence, and motivation to undertake the physical therapy intervention. Data were analyzed by SPSS (version 12.0 for Windows),[‡] with the alpha level set at .05. Chi-square tests and 1-way analyses of variance (ANOVAs) determined the intervention group equivalence on demographic and clinical data. The internal consistency of the ankle function measures was acceptable; the pre- and post–physical therapy Cronbach alphas were: .97 and .95 for the LLTQ recreational subscale, .97 and .90 for the ADL subscale, and .85 and .73 for the Motor Activity Scale, respectively.[29] Therefore, the analyses of these data involved all LLTQ items, which were summed to give total scores for the 2 LLTQ subscales (recreational and ADL) and the Motor Activity Scale.

A 1-way repeated measures ANOVA compared changes in the ankle function scores of the 2 intervention groups over the duration of the physical therapy rehabilitation. As the LLTQ ADL subscale scores of the 2 groups were significantly different at the beginning of the treatment program, analysis of covariance (ANCOVA) compared the post–physical therapy scores of the 2 groups on this measure. Preliminary checks showed that the assumptions for using ANCOVA were not violated.[30] *Post hoc* paired-samples *t* tests measured each group's change in the LLTQ ADL subscale scores over the duration of the physical therapy intervention.

For the adherence measures, the subjects' percentage of attendance, mean SIRAS scores (adherence to treatment during the physical therapy appointment), and means for each of the physical therapy modalities measured on the home adherence self-reports were calculated. A 1-way ANOVA compared the groups' percentage of clinic attendance, mean SIRAS scores, and mean adherence scores for each of the home physical therapy modalities. Because the internal consistency was acceptable for the both the SIRAS (α=.72) and home-based self-reports (α=.78), all items in each scale were included in the group comparisons. Chi-square tests determined whether

Table 2.
Demographic, Ankle Sprain, and Clinical Characteristics of the Groups

Variable	Clinic Intervention Group (n=25)	Home Intervention Group (n=22)	*P*
Age (y) ($\bar{X}\pm$SD)	29.25±13.78	30.86±11.04	.665
Sex (n)			
Male	14	14	.595
Female	11	8	
Level of sports participation (n)			
Recreational	12	11	
Competitive	12	9	.735
None	1	2	
History of previous injuries (n)	22	21	.112
Previous physical therapy intervention (n)	15	19	.091
Reasons for choosing clinic (n)			
Been before	5	4	.036
Recommended by other health care provider	5	8	
Recommended by family or friend	7	1	
Convenient	1	0	
Treatment fees	0	2	
Knew physical therapist	1	4	
Close to home	6	1	
Distance from home to clinic (km) ($\bar{X}\pm$SD)	4.32±5.04	5.35±6.60	.548
Grade of sprain (n)			
Mild	6	12	
Moderate	16	8	.092
Severe	3	2	
Recurrent sprain (n)	11	15	.171
Ankle pain at time of injury (0–10) ($\bar{X}\pm$SD)	6.96±2.49	5.95±2.08	.143

[‡] SPSS Inc, 233 S Wacker Dr, Chicago, IL 60606.

Table 3.
Descriptive Data (Mean±SD) for Pre– and Post–Physical Therapy Functional Outcome Measurements[a]

	Pre–Physical Therapy Scores		Post–Physical Therapy Scores	
	Clinic Intervention Group (n=25)	Home Intervention Group (n=22)	Clinic Intervention Group (n=22)	Home Intervention Group (n=22)
LLTQ recreational activity subscale (0–40)	27.92±11.36	20.27±12.58	12.00±10.10	8.18±7.24
LLTQ ADL subscale (0–32)	13.72±11.29	7.18±7.06	2.32±3.60	1.82±3.58
Motor Activity Scale (0–6)	1.20±2.00	1.77±1.60	5.14±1.28	5.73±1.08

[a] LLTQ=Lower Limb Task Questionnaire, ADL=activities of daily living. Note: high scores on the LLTQ and low scores on Motor Activity Scale indicate difficulty performing the activities. Possible range of scores for each measure shown in parentheses.

the number of subjects in the 2 intervention groups who completed their physical therapy intervention differed significantly.

The internal consistency for the motivation measure was unacceptably low both at pre– and post–physical therapy measurement times (Cronbach α=.55 and .43, respectively), but, with deletion of the item "By personal decision," the values increased to .85 before physical therapy intervention and .77 after physical therapy intervention. These findings indicated that this item may not be a motivation for undertaking the physical therapy intervention for its beneficial effects and, therefore, was removed for future analyses.[29] The remaining 3 items were summed to give a total motivational score, and 1-way repeated ANOVAs investigated the groups' change in these scores over the course of the physical therapy intervention.

Results

Table 2 shows the demographic and clinical data for the 2 intervention groups. The initial sample consisted of 19 female subjects and 28 male subjects, whose ages ranged from 13 to 62 years (mean [±SD]= 30.02±12.43). Forty-four subjects completed the study, Thirty-seven subjects made an uneventful recovery, and 7 subjects made an incomplete recovery, with 2 of those 7 subjects being referred to a medical specialist for other treatment. Of the 11 subjects who did not attend their final physical therapy intervention appointments, 8 were located and completed post–physical therapy measures. There were several differences among the groups' reasons for their choice of physical therapy clinic. A trend occurred toward significantly more subjects with mild sprains being in the home intervention group, whereas more subjects with moderate sprains were in the clinic intervention.

Table 3 shows the descriptive data for the pre– and post–physical therapy ankle function scores of the 2 groups. Over the duration of the course of physical therapy intervention, the group scores changed significantly on the LLTQ recreational activity subscale ($P<.0001$) and the Motor Activity Scale ($P<.0001$), but there was no significant difference between the groups' rate of change on either measure ($P>.05$). Similarly, the ANCOVA revealed that the LLTQ ADL subscale scores of the groups were not significantly different by the end of the course of physical therapy intervention ($P>.05$). The LLTQ ADL subscale scores of both groups decreased over the course of physical therapy intervention (clinic intervention group: $P<.0001$, home intervention group: $P<.002$).

The descriptive data and comparison of the group scores for clinic attendance, percentage of attendance, completion of physical therapy intervention, and adherence to clinic- and home-based programs are presented in Table 4. As expected, based on the study design, significant differences occurred between the 2 groups for the number of clinic appointments attended and the number required, with the home intervention group requiring and attending fewer clinic appointments than the clinic intervention group. There was a significance difference in the percentage of attendance, with the home intervention group having a higher percentage of attendance. In addition, significantly more subjects in the home intervention group completed their course of physical therapy intervention compared with the clinic intervention group. However, both groups' mean scores on the SIRAS (clinic adherence) and adherence to the physical therapy modalities undertaken at home were high and did not differ significantly. As shown in Table 5, the pre– and post–physical therapy motivation scores of both groups were high for their motivation to start the physical therapy intervention and did not differ significantly over time.

Discussion

Our results did support the first hypothesis, because by the end of the

Table 4.
Descriptive Data (Mean±SD) and Significance Levels of Statistical Comparison of the Groups' Clinic Attendance and Adherence to Clinic- and Home-Based Programs

Variable	Clinic Intervention Group (n=25)	Home Intervention Group (n=22)	*P*
Appointments attended, n	7.64±4.54	4.55±1.87	.005
Appointments recommended, n	8.44±4.12	4.68±1.78	.0001
Percentage of attendance	87.28±17.76	96.59±8.78	.031
Number who completed physical therapy intervention	15	21	.004
SIRAS[a] score (adherence during clinic appointment, 1–5)	4.66±0.47	4.60±0.36	.625
Self-report of adherence to home-based program (1–5)[b]			
Exercises	4.06±1.04	3.74±0.94	.275
Refraining from activity	4.40±0.64	4.08±1.12	.250
Ice	3.49±1.08	3.56±1.32	.878
Ankle strapping	4.38±0.80	3.92±1.04	.112
Elevation	3.82±0.98	3.45±1.25	.310

[a] SIRAS=Sport Injury Rehabilitation Adherence Scale.
[b] 1=none, 5=all.

course of physical therapy intervention, the ankle function of both groups did not differ significantly, and both groups made a significant improvement in their function over the duration of the physical therapy intervention program. Our data partially supported the second hypothesis: the 2 groups did not differ on their clinic- and home-based treatment adherence scores, but the home intervention group did fare significantly better on their rate of completion of their course of physical therapy intervention and their percentage of attendance. Support was provided for the third hypothesis: the groups did not differ on their motivation to start the physical therapy intervention. Beyond these general observations, a number of issues related to the results and study design need to be highlighted.

First, the manner in which ankle function scores of the 2 intervention groups changed over the duration of their course of physical therapy intervention demonstrates that they had a similar rate of recovery from their sprain. Of the 47 subjects who commenced the study, 37 had an uncomplicated recovery and regained full ankle function, which may have been due to several reasons. To some extent, this favorable recovery was to be expected because the majority of the subjects had either mild or moderate ankle sprains, which respond well to physical therapy intervention.[17] In line with other research,[19,31,32] the subjects' moderate-to-high levels of adherence may have contributed, in part, to their improved ankle function over the duration of the treatment program. Based on the similar rate of improvement in ankle function in both groups over

Table 5.
Group Descriptive Data and the Significance Levels of the Pre– and Post–Physical Therapy Motivation Scores and Their Change Over the Duration of the Physical Therapy Intervention Program

	Clinic Intervention Group		Home Intervention Group		Time Effect Significance (*P*)	Time × Group Effect Significance (*P*)
	n	Mean±SD	n	Mean±SD		
Pre–physical therapy intervention scores (3–21)	25	19.24±2.20	22	18.91±2.24		
Post–physical therapy intervention scores (3–21)	22	19.00±2.29	22	18.82±1.65	.505	.687

the course of the treatment, the home intervention group was not disadvantaged by undertaking the bulk of their physical therapy intervention at home. This finding adds further support to the notion that patients can implement their treatment at home in safe and effective manner.[7]

Second, one of the reasons for undertaking this study was to establish whether attendance at clinic appointments could be improved by increasing the amount of physical therapy intervention that patients are required to carry out at home, thereby decreasing the need for frequent clinic appointments. This improvement did occur in this study, as the home intervention group had a significantly higher percentage of attendance and significantly more subjects in that group completed their course of physical therapy intervention than the clinic intervention group. Other research has shown that patients who believe their treatment sessions are of value are more likely to attend their clinic appointments and to adhere to the treatment requirements,[2,10,33] which may have been a reason for the home intervention group's higher percentage of attendance.

Third, the level of adherence of both intervention groups to the clinic- and home-based components of the physical therapy intervention was high, which may have been influenced by the high number of subjects (n=34) who previously had received physical therapy intervention. Not only might this finding indicate that those subjects who had previously been treated by physical therapists have an insight into the features of physical therapy intervention programs, but, as Hall et al[34] found, also indicate consumer satisfaction with their earlier courses of physical therapy intervention. Furthermore, the educational techniques used by the physical therapists during the clinic treatments are recognized methods of improving patients' understanding of their role in the treatment and their adherence to it.[6,7,35,36] The physical therapists in this study gave clear and simple verbal and written explanations about the subjects' injury and treatment, advised the subjects on strategies for remembering to do their home activities, and adapted the treatment to suit the subjects' injury and recovery.

Fourth, the home intervention group's relatively high levels of adherence to the components of the home physical therapy intervention program may have been due, in part, to the assistance they were given to undertake their home treatment (eg, equipment, booklet, educational and cognitive behavioral strategies). All of these strategies were drawn from previous studies[11–16] in which the strategies were shown to be valuable in overcoming barriers to adherence. In addition, the booklet information and cognitive-behavioral strategies were designed so that they could be tailored to suit the severity of the subjects' sprain, their rate of recovery, and their educational needs. For example, the subjects were advised to use cognitive-behavioral strategies that they found particularly useful for remembering everyday activities.

The most popular self-selected method was to leave the equipment and booklet in noticeable places to cue the subjects to do their physical therapy interventions. Similarly, the treatment goals were adapted to suit the severity of the subjects' sprain and their rate of recovery, thereby providing them with targets to meet and a guide as to when they would need to make their next appointment. Likewise, the physical therapists found the contents of the booklet useful as a guide for prescribing and teaching the home intervention group their physical therapy intervention program, which ensured consistency of information, a reputed precursor to adherence.[37]

Anecdotally, subjects in the home intervention group reported having difficulty with more complex techniques at home, particularly the ankle strapping. These difficulties occurred despite being taught how to strap and being given diagrams illustrating the method, which highlights problems patients can have undertaking complex treatments in the home environment.[38,39]

Fifth, the subjects' initial motivation to undertake the physical therapy intervention was high and remained so over the duration of the course of treatment. In line with the findings of previous research,[19,40–42] it appears that motivation of the subjects may have had some bearing on their high levels of adherence.

Sixth, there were a number of limitations in this study. A detailed cost analysis of the 2 levels of intervention was not undertaken, so it is unclear whether the use of home-based physical therapy intervention programs really reduced treatment costs. However, from the records of the prices paid for the materials and equipment for the home intervention group, we found that the adherence-enhancing materials (booklet and cue cards) cost $17US and the treatment equipment cost $37US per subject. Although randomization failed to produce group equivalency on the pre–physical therapy level of ankle function on the LLTQ ADL subscale, there was equivalency on the other 2 function measures—the LLTQ recreational activities subscale and the Motor Activity Scale. In future research, the lack of group equivalency could be overcome by using a combination of randomization and matching subjects

on the basis of their injury severity, whether the sprain is recurrent or not, and level of sports participation.

In addition, the physical therapists had problems discriminating between severe grade I (mild) and mild grade II (moderate) ankle sprains, which could be averted by strictly applying O'Donoghue's[21] criteria and using an independent assessor. In addition, many of the physical therapists admitted to using their own heuristics for grading the ankle sprains, and although these methods were based on O'Donoghue's[21] criteria, discrepancies did creep into their assessments. More investigations into the effectiveness and safety of home-based physical therapy intervention programs for other acute injuries are warranted, and such research should attempt to overcome the present study's limitations.

Conclusions

The findings of this study demonstrate that home-based physical therapy intervention plus adherence-enhancing adjuncts is a safe and viable option for patients with ankle sprains, and physical therapists should contemplate using it with patients who have problems attending regular clinic appointments. The subjects in the home intervention group were not disadvantaged in terms of their rate of recovery, and their treatment adherence was comparable to that of the clinic intervention group. However, caution is needed when generalizing these outcomes to other injuries, as every patient and every injury have different needs, and some injuries may be best treated under close supervision. Likewise, not every patient will feel comfortable about undertaking the majority of their physical therapy interventions at home; therefore, clinic-based physical therapy intervention with closer supervision may be a preferable treatment option for these people.

Both authors provided concept/idea/research design, writing, and data analysis. Dr Bassett undertook the data collection.

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