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## Physiotherapy for Patients with Lateral Ankle Sprains, A prospective survey of practice patterns in Dutch primary health care

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**SUMMARY** The goal of this study is to describe treatment patterns by Dutch physiotherapists for patients with lateral ankle sprains, and to compare them with assumptions on expected treatment that are derived from the literature.

For this purpose, data of 251 patients with a sprain of the ankle were compared with a reference group of 16,823 patients with different medical diagnoses. Data concerned patient characteristics, treatment sessions, goals pursued (defined in terms of impairments and disabilities), and interventions applied by physiotherapists.

As expected, important treatment goals for these patients were to reduce swelling, improve stability of the joint and muscle power, and enhance mobility. Bandaging and exercise were frequently used. Contrary to expectations, little emphasis was found on instructions for home exercises and on reduction of disability in the last phase of treatment. Ultrasound and shortwave therapy were applied more frequently than expected.

Regarding the essential aspects of functional treatment, a moderate degree of correspondence was found between actual treatment of patients with sprained ankles and assumptions on expected treatment. The discrepancies found between theory and practice may stimulate physiotherapists to reconsider these aspects of their treatment.

### INTRODUCTION

#### Aims

Ankle sprains occur relatively frequently in sports and in household or professional activities. Most ankle sprains are inversion injuries, with acute tears of the lateral ligaments of the ankle (McPoil and McGarvey, 1988; Hunter, 1990; Simpson, 1991). In the Netherlands, the incidence of ankle sprains in which medical treatment is given by a general practitioner or emergency department of a hospital has been estimated at 1.6% (Grol et al, 1991; Van de Lisdonk et al, 1994). Many of these patients are referred to a physiotherapist in primary health care. Annually, Dutch general practitioners refer an estimated 7% to 13% of

patients with ankle sprains to a physiotherapist, or about 30,000 patients a year (Grol et al, 1991; Lamberts, 1991; Uunk et al, 1991). Orthopaedic specialists also refer patients to physiotherapists in primary health care who are not included in this estimate.

There is a lack of specific information on practice patterns of physiotherapists for patients with sprained ankles, addressing for example treatment goals, and timing of interventions in the course of treatment. Knowledge about this treatment is important for the further development of physical therapy as a professional discipline, and for designing meaningful clinical research (Rothstein, 1996). Therefore, the first aim of the present article was to describe practice patterns actually used for patients with ankle sprains by Dutch physiotherapists working in the primary health care system.

Secondly, at present it is not known whether the actual treatment for these patients corresponds with the expected treatment, based on present knowledge. This raises the question of whether the treatment is appropriate. This is essential information from the perspective of an efficient application of care (Dunning et al, 1991; Ziekenfondsraad, 1993; Van Eijkeren, 1995; Hendriks et al, 1995; Van Ravensberg et al, 1995; Hendriks et al, 1996). Therefore, the second aim of the study was to investigate the degree of correspondence between theory and practice regarding the treatment of patients with sprained ankles. The present study is part of a larger research project, addressing appropriate physiotherapy for several patient groups and interventions.

### **Expectations from the Literature**

Based on the literature, we have formulated a number of assumptions on the expected treatment for patients with sprained ankles. The literature includes research on the effectiveness of specific treatments in patients with an ankle sprain, laboratory research on the healing process in connective tissue, and accumulated clinical experience. First, the assumptions focus on general characteristics such as treatment goals and interventions. Secondly, we have formulated assumptions regarding subsequent phases of treatment, because the relative importance of goals and interventions is expected to change in the course of treatment. The assumptions of expected physiotherapy will be described in this part of the introduction.

A brief description of treatment given by physiotherapists to patients with a lateral ankle sprain is provided in a review by Kannus and Renstrom: 'Treatment includes only a short period of immobilisation and protection by tape, bandage, or a brace, and allows early weightbearing. Range-of-motion exercises, as well as neuromuscular exercises for ankle stability, should begin early' (Kannus and Renstrom, 1991). This type of treatment is often referred to as functional treatment, or functional immobilisation, as opposed to other types of treatment, such as immobilisation by means of a plaster cast or operative repair (Oostendorp, 1987; Brink et al, 1988; Van der Ent, 1989; Kannus and Renstrom, 1991). Clinical studies that compare different types of treatment for patients with ankle sprains show a high degree of consensus on the preference for functional treatment (Brooks et al, 1981; Van Moppes and Van den Hoogenband, 1982; Kannus and Renstrom, 1991; Zwipp and Schievink, 1992).

### **General Characteristics of Treatment**

According to the literature, important treatment principles in physiotherapy for patients with an ankle sprain are short immobilisation on the one hand and early mobilisation and progressive functional loading on the other. Immobilisation will accelerate inflammation and connective tissue repair in the early phases of the healing process (Reed and Zarro, 1986; Kannus and Renstrom, 1991). However, prolonged immobilisation will be accompanied by unwanted effects on the periarticular tissues, that will hamper functional recovery. These effects include adhesions, stiffness of a joint, muscular atrophy, and changes in neuromuscular function, for example (Brostrom, 1966; Reed and Zarro, 1986; Oostendorp, 1987; Sammarco, 1991).

Secondly, early mobilisation is essential in achieving recovery of function after inflammation and repair, and in avoiding unwanted side effects of immobilisation (Brostrom, 1966; Van Moppes and Van den Hoogenband, 1982; MollerLarsen et al, 1988; Hunter, 1990; Kannus and Renstrom, 1991; Sammarco, 1991).

Thirdly, treatment is characterised by progressive functional loading (up to patients' tolerance of pain), thus aiming at a gradual return to daily activities and sports (Kergerreis, 1983; Hunter, 1990).

Based on these treatment principles, in the next section we have formulated three general assumptions on treatment to be expected for patients with an ankle sprain.

Table 1 gives an overview of these assumptions.

## [TABLE 1]

### 1. Treatment Goals

#### *1.1 Reduction of Impairments*

It is expected that important treatment goals will be to reduce signs of inflammation, especially pain and swelling, and to improve impaired function, such as regaining stability of the joint, and to a lesser extent increasing range of motion and muscle power (Garrick, 1981; Oostendorp, 1987; Howell, 1988; Kannus and Renstrom, 1991; De Bie et al, 1998b).

#### *1.2 Reduction of Disability*

From the importance of progressive functional loading it is to be expected that a relatively large part of treatment will be aimed at a reduction of disabilities, such as difficulty in walking (mobility), in sports, and in work or household activities (Van Moppes and Van den Hoogenband, 1982; Kergerreis, 1983; Hunter, 1990; De Bie et al, 1998b).

### 2. Interventions

The use of a bandage or tape is an important intervention in achieving early mobilisation. Bandaging, however, may not be seen as an independent intervention, but as a part of a broader treatment programme. It is expected to be combined with other interventions, such as exercise therapy, instructions for home exercises, and advice to restart gradually weight-bearing activities, using crutches when needed. Accordingly, these interventions will constitute a relatively large part of treatment (Van Moppes and Van den Hoogenband, 1982; Oostendorp, 1987; Brink et al, 1988; Howell, 1988; Van der Ent, 1989; De Bie et al, 1998a, b).

#### **Subsequent Phases of Treatment**

In terms of the physiology of healing, the timing of the application of immobilisation and mobilisation in the course of treatment is critical, as it is important both to avoid early tissue damage and to improve the tensile strength of the connective tissue by loading the joint. In order to formulate more specific assumptions on the expected techniques in the course of treatment, we distinguish four treatment phases, which are defined in accordance with the phases of the healing process (Reed and Zarro, 1986; Howell, 1988; Prentice and Bell, 1990).

A. The early inflammation phase (0 to 3 days) is directed at the first response to tissue damage. In this phase the function of the affected ankle is obviously impaired, and loading the ankle should be avoided.

B. The early proliferative phase (4 to 10 days) overlaps with the late inflammation phase. It is characterised by the beginning of the repair process, with the formation of new blood vessels and new connective tissue. During this phase the joint may start to become loadbearing again.

C. The late proliferative phase (11 days to 3 weeks) is when the tensile strength of the connective tissue is increased according to the forces exerted on the tissue (Reed and Zarro, 1986; Howell, 1988; Prentice and Bell, 1990). Early remodelling comes at the end of this phase.

D. The late remodelling or maturation phase (3 to 8 weeks) is reached when tensile strength is sufficient to permit active movements, which then accelerate the healing process (Brostrom, 1966). If there is no delay in the healing process, total recovery of ankle function can be expected at six to eight weeks after injury (Van Moppes and Van den Hoogenband, 1982; Oostendorp, 1987; Moller-Larsen et al, 1988; Van den Bosch et al, 1993; De Bie et al, 1998b).

By phasing tissue reactions in this way, adequate timing of treatment goals and interventions in the course of treatment may be expected. We have formulated the following specific assumptions (see also table 1):

### **3. Treatment Goals in Subsequent Phases**

#### *3.1 Decreasing Emphasis on Pain, Swelling and Impaired Functions*

Physiotherapists are expected to pursue a reduction of pain and swelling principally in the early inflammation phase. After the inflammation has stabilised, considerably less attention to these goals is expected in later phases (Oostendorp, 1987; Howell, 1988; Hunter, 1990). Subsequently, for example in phases B and C, physiotherapists are expected to put much emphasis on maintaining and restoring impaired function (stability, range of motion, muscle power) (Brostrom, 1966; Van Moppes and Van den Hoogenband, 1982; Oostendorp, 1987; Howell, 1988; Moller-Larsen et al, 1988; Hunter, 1990; Kannus and Renstrom, 1991). It is assumed that in the late remodelling phase these goals are less important.

#### *3.2 Increasing Emphasis on Disability in Functional Activities*

Attention to treatment goals regarding disability is expected to start in the early proliferative phase, and this will further increase in the late proliferative and remodelling phases, in which normal loading of the ankle joint is expected to return. It is assumed that treatment first aims at disability in standing and walking (phases B and C), and in the last phase of treatment at disability in daily activities such as work, household, and sports activities (Garrick, 1981; Van Moppes and Van den Hoogenband, 1982; Kergerreis, 1983; Hunter, 1990; Eiff et al, 1994; De Bie et al, 1998b).

### **4. Interventions in Subsequent Phases**

#### *4.1 Bandaging in Early and Late Proliferative Phases*

It is expected that physiotherapists will bandage or tape the ankle joint in the early proliferative phase, when the swelling stops and pain is tolerable (Brostrom, 1966; Garrick, 1981; Van Moppes and Van den Hoogenband, 1982; Oostendorp, 1987; Moller-Larsen et al, 1988; Hunter, 1990; Zwipp and Schievink, 1992; Van den Bosch et al, 1993; De Bie et al, 1998b). In the late proliferative phase a bandage or tape can be used when needed to stabilise the ankle joint during exercise or activities (Van Moppes and Van den Hoogenband, 1982; Van den Bosch et al, 1993; Eiff et al, 1994; De Bie et al, 1998b). Accordingly, a bandage is used less frequently in this phase, and can be dispensed with at the end of it.

#### *4.2 Increase of Exercise Therapy and Instructions For Exercises*

The contribution of exercise therapy starts gradually in the early inflammation phase by means of passive mobilization exercises (Howell, 1988; De Bie et al, 1998b). The role of exercise therapy is expected to increase in the early proliferative phase, involving active exercises, partially weight-bearing and gait training. In the late proliferative and remodelling phases exercise therapy, including for example dynamic stabilisation exercises, and proprioceptive training, as well as instructions for home exercises is an essential part of treatment (Brooks et al, 1981; Garrick, 1981; Van Moppes and Van den Hoogenband, 1982; Oostendorp, 1987; Howell, 1988; Hunter, 1990; Kannus and Renstrom, 1991; De Bie et al, 199813).

#### *4.3 Advice on Rules for Daily Living*

Throughout all phases of treatment it is assumed that advice will be given on rules for daily living. This advice is related to the particular phase of treatment and refers, for example, to the application of rest, ice, elevation and exercise, the use of crutches, and preventive measures (Brooks et al, 1981; Garrick, 1981; Van Moppes and Van den Hoogenband, 1982; Meeusen and Lievens, 1986; Oostendorp, 1987; Howell, 1988; Moller-Larsen et al, 1988; Hunter, 1990; Kannus and Renstrom, 1991; Eiff et al, 1994; De Bie et al, 1998b).

### **5. Longer Treatment**

After the remodelling phase, additional treatment may be necessary for some patients. This phase of treatment is directed at supervising the return of these patients to sporting activities, or professional activities in which a high load is put on the ankle (De Bie et al, 1998b).

## **MATERIALS AND METHODS**

### **Survey of Physical Therapy in Primary Health Care**

From 1989 to 1992 a survey was conducted among physiotherapists working in physiotherapy practices in primary health care. In the Netherlands, about 60% of all physiotherapists work in this setting. A random sample of 83 physiotherapists from 32 practices participated. The general characteristics of the participating therapists did not deviate substantially from those of all Dutch physiotherapists in primary health care. The survey results can therefore be generalised (Dekker et al, 1993; Roebroek et al, 1998).

### **Assessment**

Physiotherapists registered patients during their total episode of physical therapy treatment, using a standardised patient record form (Van Triet et al, 1990; Dekker et al, 1993; Dekker and Van Baar, 1995; Van der Valk et al, 1995a). The form has three main sections. The first two sections were filled in at the start of treatment. The first section concerns general patient characteristics, complaints, and the referral diagnosis, established by the referring physician (four diagnoses could be established for each patient). Referral diagnoses were classified by the researcher, according to the International Classification of Primary Care (ICPC) (Lamberts and Wood, 1987). In the second section important aspects of the physiotherapist's diagnosis were assessed in terms of impairments and disabilities (International Classification of Impairments, Disabilities and Handicaps) (WHO, 1980). In a reliability study, the interobserver reliability of these items was found to be sufficiently high (Van Triet et al, 1990).



The third section of the form was completed after each treatment session and refers to treatment goals regarding impairments and disabilities and to physiotherapy intervention used. For each session, a physiotherapist could choose a maximum of four treatment goals and specify one intervention for each goal. For example, he or she could indicate improved stabilisation of the joint as a therapeutic goal and exercise therapy as the intervention to attain this goal.

### **Patients**

A total of 17,201 consecutive patients with a broad variety of referral diagnoses, applying for treatment were registered and included in the study. The present part of the study focuses on the treatment of patients with ankle sprains. On the basis of their referral diagnosis, established by the referring physician, a sprain of the ankle (ICPC code L77; Lamberts and Wood, 1987) was indicated in 378 patients. Of these, 29 patients were excluded because treatment data were missing. Analysis was performed on the remaining 72% of patients (the ankle group,  $n = 251$ ), whose episode of physical therapy treatment lasted at least three weeks. This period is assumed to be long enough to examine differences between treatment phases. Another 98 patients (28%) finished their treatment within three weeks, and were excluded from analysis.

Assumptions with respect to the treatment of patients with ankle sprains, such as the occurrence of specific treatment goals and interventions, were tested by comparing the ankle group with a general category of patients, without sprained ankles (the reference group) (Roebroek et al, 1998). Patients with a referral diagnosis different from L77 and no missing data on treatment characteristics were included in the reference group ( $n = 16,823$ ). In this approach, referred to as the case-referent approach in epidemiologic research, the reference group provides an 'anchor' towards which comparisons can be made (Miettinen, 1982, 1985). For example, if an intervention such as bandaging or taping is expected to be appropriate for treating patients with ankle sprains, this intervention should occur more often for patients in the ankle group than for the general category of patients, ie the reference group.

### **Data Analysis**

Data on treatment goals and interventions were aggregated to the level of episodes of treatment (Dekker et al, 1993, 1995; Van der Valk et al, 1995b). This was done because each episode includes different numbers of treatment sessions, and each session entails different numbers and types of treatment goals and interventions.

For each patient the relative occurrence of specific interventions in the treatment was calculated. The frequency of the use of a specific intervention was divided by the frequency of all interventions used during treatment. For example, if a patient had ten sessions of treatment in which he was treated eight times with ultrasound, four times with massage and four times with exercise, the relative occurrence of ultrasound for this particular patient was 50% and the relative occurrences of massage therapy and exercise therapy were both 25%. If no other interventions were used in this patient, their relative occurrence would be 0%. In a similar way, treatment goals for impairments and disabilities were reduced to the level of individual patients.

To investigate treatment characteristics in different phases, data were allocated to treatment phases A to D as described above.

### **Statistical Analysis**

For general characteristics of treatment (for example duration of treatment, treatment goals) differences between the ankle and reference groups were tested by means of a chi-square

test. If significant, the strength of the relationships was expressed as Cramer coefficient V (r x c tables) or phi (2 x 2 tables, nominal level) (Siegel and Castellan, 1988).

For each intervention, we tested whether its mean relative occurrence to the treatment differed significantly between the ankle and reference groups. Similarly, differences were tested for the relative occurrence of treatment goals regarding impairments and disabilities. Because the distributions of relative occurrences of interventions and treatment goals did not correspond to a Gaussian distribution, a nonparametric Kruskal-Wallis one-way analysis of variance was used (Siegel and Castellan, 1988). Spearman rank-order correlation coefficient  $r_s$  (ordinal level) was used to assess the strength of the relationships (Siegel and Castellan, 1988).

Differences in the relative occurrence of interventions and treatment goals in various phases of the treatment were tested within the ankle group. In this case the non-parametric Friedman test for matched samples was used (Siegel and Castellan, 1988).

For all tests, the significance level was set at 0.01. Analyses were performed using SPSS-X<sup>1</sup>.

## RESULTS

### General Characteristics of Patients and their Complaints

More than half of the patients with an ankle sprain were male (55%). In this respect, the group, in which 45% were male ( $P \geq 0.01$ ). The relationship, however, was weak ( $\phi = 0.02$ ).

The age distribution in patients of the ankle group and of the reference group is shown in table 2. More patients in the ankle group (57.8%) were between 15 and 35 years of age ( $P \leq 0.001$ , Cramer V = 0.09).

The most often mentioned causes of injury in patients with sprained ankles were trauma (68%) and sport (30%). This is more than in the reference group in which these percentages were 32% and 9% respectively ( $P \leq 0.001$ , Cramer V = 0.17). Of the patients with sprained ankles 13% were suffering a reinjury, compared to 37% in the reference group ( $P \leq 0.001$ , Cramer V = 0.06).

The duration of patients' complaints is shown in table 3. Complaints of a recent onset, eg less than ten days before the start of treatment, were found in a relatively large number of patients in the ankle group (44% versus 19% in the reference group) ( $P \leq 0.001$ ; Cramer V = 0.08)

[TABLE 2]

[TABLE 3]

### Characteristics of Treatment in General

#### *Duration of Treatment*

According to the inclusion criterion, duration of treatment of patients in the analysis (the ankle group) was at least three weeks. In three-quarters of these patients ( $n = 188$ ) treatment

<sup>1</sup> SPSS-X, Release 4.1. Chicago, 111: SPSS Inc; 1991

was finished within eight weeks; the other quarter ( $n = 63$ ), had treatment of more than eight weeks.

### *Treatment Goals*

The mean relative occurrence (and SD) of treatment goals pursued for the ankle group is shown in table 4, and compared with the reference group. As expected, reduction of swelling and improved stabilisation of the joint are frequently chosen treatment goals for patients in the ankle group (19.2% and 18%) as compared with the reference group (3% and 1.7%) ( $P \leq 0.001$ ,  $r_s = 0.21$  and  $0.22$ ). The improvement of muscle power is also more often a treatment goal in the ankle group (8%) than in the reference group (6.1%), but the strength of this relationship was very weak ( $P \leq 0.001$ ,  $r_s = 0.04$ ). On the other hand, the emphasis on pain reduction as a treatment goal in the ankle group (29.9%) did not differ from the reference group (32%). Improvement of range of motion (8.8%) is a relatively less frequently chosen treatment goal in the ankle group compared to the reference group (18.8%) ( $P \leq 0.001$ ,  $r_s = -0.05$ ).

At disability level, improvement of mobility (including walking) is relatively often found as a treatment goal (44.8%) compared with the reference group (14.2%) ( $P \leq 0.001$ ,  $r_s = 0.12$ ). The same applies to the improvement of performance in sports and hobbies (13.8% versus 5%) ( $P \leq 0.001$ ,  $r_s = 0.07$ ). Contrary to our assumption, the improvement of performance in work or household activities (including standing for long periods and maintaining normal speed during work) was a relatively infrequently chosen treatment goal (16.6%) compared with the reference group (35.8%) ( $P \leq 0.001$ ,  $r_s = -0.04$ ).

### *Interventions*

Table 4 shows the mean relative occurrence (and SD) of the most frequently applied interventions in treatment, both for the ankle group and reference group. Bandaging was relatively frequently applied in the ankle group, with a relative occurrence to treatment of 11.8% versus 0.4% ( $P \leq 0.001$ ,  $r_s = 0.35$ ). Other interventions applied relatively often in the ankle group are exercise and instruction for home exercises (23.1% and 11.4% versus 19.9% and 9.4% respectively) ( $P \leq 0.001$ ,  $r_s = 0.03$  and  $0.02$ ). The use of ultrasound (14.3%) and shortwave (6.7%) is also relatively large compared to the reference group (7.1% and 3%) ( $P \leq 0.001$ ,  $r_s = 0.09$  and  $0.06$ ). In contrast to our assumption, advice on rules for daily living was given very rarely in the ankle group (1.7%), which was not much different from the reference group (1.6%).

## [TABLE 4]

### **Subsequent Phases of Treatment**

In this section an overview is given on the relative occurrence of treatment goals and interventions to the subsequent phases of treatment for patients with sprained ankles. For the phases A to D the relative occurrence of treatment goals at the level of impairments is shown in figure 1 (overleaf); the relative occurrence of goals at the level of disabilities is found in figure 2. Figure 3 concerns the relative occurrence of interventions in the four treatment phases. Below, we will elaborate on the results from the perspective of the assumptions on expected treatment in different phases.

### *Attention to Impairments in Different Phases*



Corresponding to our expectations, a relatively strong emphasis on reduction of pain and swelling was found in the early inflammation phase (see figure 1, phase A), 28% and 29.9% respectively. The relative occurrence of pain reduction, however, did not change significantly in the course of treatment, whereas the attention paid to reducing swelling decreased in the subsequent phases, to 13.6% in the late remodelling phase ( $P \leq 0.001$ ).

In the proliferative phases (B and C) much emphasis is expected on an improvement of impaired functions. Corresponding with this, stabilisation of the ankle joint was pursued relatively more often in these phases (15.1% and 16.9% respectively) compared with the earlier inflammation phase (14.1%) ( $P \leq 0.01$ ). In contradistinction to assumption 3.1, however, the mean relative occurrence of this treatment goal was the largest in the late remodelling phase (21.2%). For other goals at the impairment level, eg improvement of range of motion and muscle force, no significant changes were found in the course of treatment (fig 1).

### [FIGURE 1]

#### *Attention to Disabilities in Different Phases*

At disability level, a relatively large part of treatment in the first three phases aimed at an improvement of mobility, including walking (48.1%, 48.9%, and 46.2% respectively fig 2). In the last phase of treatment, the late remodelling phase, the relative occurrence of this goal seemed to be smaller (39.2%), but differences in the course of treatment were not significant.

The relative occurrence of treatment goals concerning improvement of work or household activities and sports or hobbies tended to be larger in the late remodelling phase than in the preceding phases (fig 2). However, these trends were also not significant.

### [FIGURE 2]

#### *Interventions in Different Phases*

In the early inflammation phase a broad range of interventions was applied, eg exercise, massage, bandaging, shortwave, ultrasound, and instructions for home exercises. These interventions contribute in a comparable degree to treatment in this phase (fig 3). Contrary to assumption 4.3, the relative occurrence of advice on rules for daily living was very small in the early inflammation phase (2.8%), and remained small in the course of treatment (fig 3).

Changes in the relative occurrence of bandaging and exercise in the subsequent phases corresponded with assumptions 4.1 and 4.2. The occurrence of bandaging/ taping was relatively large in the early proliferative phase (17%), and decreased slightly in late proliferative phase (15.9%). Its relative occurrence was reduced to 9.2% in the late remodelling phase D ( $P \leq 0.001$ ). The occurrence of exercise was relatively small in the early inflammation phase (8%), and increased considerably in the course of treatment ( $P \leq 0.001$ ). In the late proliferative and remodelling phases, exercise was applied in 25.2% and 30.2% of treatments. This pattern was not found for instruction on home exercises, whose relative occurrence in the phases C and D was not different from the preceding phases, although a trend in this direction can be seen in figure 3.

Furthermore, it was found that the relative occurrence of massage and ultrasound increased in the course of treatment (for both interventions applied most frequently in the late proliferative phase (14.1%), and ultrasound in the late remodelling phase (15.1%).

[FIGURE 3]

### **Treatment of Longer Duration**

The last phase targeted goals concerning disabilities, eg improved performance with respect to mobility (mean relative occurrence 33.2%) and sports or hobbies (21.2%), for the 63 patients whose treatment continued longer than eight weeks. In this phase, treatment also aimed at the reduction of impairments, such as pain (29.2%) and impaired joint stability (18%).

Important interventions in this phase were exercise and massage, with a relative occurrence of 38.8% and 18.2% respectively.

## **DISCUSSION**

### **Selection of the Ankle Group**

Patients were selected for the ankle group according to their medical diagnosis, established by the referring physician. Assessment of functional instability has been found to be a useful diagnostic tool (Martin et al, 1996). Although in some patients physical examination of the ankle in the acute inflammation phase might have been hampered by pain and swelling (Van Dijk, 1994), there is no reason to suspect a large number of incorrect diagnoses.

The time after injury at which a patient enters treatment is also important. It has been shown that half of the patients did not start treatment immediately after injury, but only after ten days or so or even after six weeks. It is probable that the distinction of treatment phases used in this study was not suitable for these patients. We checked that our data did not differ between these 'sub-acute' ankle patients and 'acute' ankle patients. Thus, we assume that the majority of patients in the present ankle group were rightly selected.

### **Moderate Emphasis on Functional Loading**

The purpose of the present study was to assess the appropriateness of treatment that is provided by physiotherapists in primary care to patients with sprained ankles. An essential point in the assumptions about expected treatment derived from the clinical literature and results of experimental studies, is that the ankle should be used functionally as soon as possible. It was expected therefore that the reduction of disabilities would be an important treatment goal, and that exercise therapy and instruction for home exercises are essential parts of treatment. As discussed in the next sections, these aspects were found to be present in the treatment actually provided by physiotherapists, but to smaller extent than expected.

### **Treatment Goals**

Correspondence with the expected treatment varied with respect to goals at the impairment level. As expected, treatment was relatively frequently aimed at reducing swelling and improving stability of the joint and muscle power. In contrast to assumptions 1.1 and 3.1, however, attention to pain reduction did not differ from the reference group, and treatment was less frequently aimed at an improvement in the range of motion. It is noteworthy that pain reduction remains an important goal in the course of treatment. Nor did the emphasis on improving joint stability in the late remodelling phase correspond with assumption 3.1. Perhaps this latter finding is not so controversial, because improving joint stability is an aspect to which physiotherapists might pay explicit attention in treating disabilities.

With respect to pain reduction, it may be assumed that a different kind of pain is involved in later phases of treatment, as compared with the first phase in which pain is one of the responses in the inflammatory reaction. In a later phase, pain is often interpreted as a

symptom of an ankle joint too heavily loaded. This has consequences for the choice of intervention to reduce pain. In a later phase of treatment, exercise therapy, for example, may be an adequate intervention in improving the ability of the joint to bear weight.

Corresponding to assumptions 1.2 and 3.2 regarding goals at the disability level, for the ankle group a great deal of attention was paid to improving patient mobility, especially walking. This might be explained by the attention that physiotherapists have traditionally paid to gait training, aiming to achieve a normal gait pattern (De Bie et al, 1998b). An improvement of performance in sports or hobbies is also pursued relatively often in the ankle group. In the course of treatment, however, the emphasis on this goal and on performance of work or household activities did not increase as much as expected.

### **Interventions**

In accordance with the assumptions on interventions (2, 4.1, 4.2, 4.3), it has been found that the application of a bandage or tape and exercise therapy are essential parts of treatment, with a relatively strong emphasis on bandaging in the proliferative phases, and an increasing role of exercise therapy in the course of treatment. Instruction for home exercises and advice on rules for daily living were applied far less frequently than expected (in the reference group also), and their application did not increase in the later phases of treatment. Both interventions might have been under-recorded in the present study. In a previous survey it was found that physiotherapists gave advice to one-third of the patients (Kerssens and Curfs, 1993). In our opinion however the capacity of the present registration form, with four possible interventions in each treatment session, was sufficient and is probably not a cause of possible under-recording. In 95% of the patients in the ankle group an average of three interventions were filled in for each treatment session, and thus one more intervention was left open. A more reasonable explanation might be that physiotherapists consider instructions and advice as a self-evident part of any treatment and not as a separate intervention. This has been shown by Sluijs et al (1993) who found that different kinds of patient education, eg teaching about the illness, exercise instructions and advice, were inherently a part of physical therapy.

Contrary to the second assumption, physical applications such as ultrasound and shortwave were used relatively often in patients of the ankle group. The use of ultrasound even increased in the course of treatment. These findings are remarkable, as the effectiveness of these interventions has scarcely been investigated, and with the exception of one study (Wilson, 1972) no or only partially positive effects were found (Pasila et al, 1978; Barker et al, 1985; Williamson et al, 1986; Michlovitz et al, 1988; Kitchen and Partridge, 1992; Aufdemkampe et al, 1993; Pennington et al, 1993; De Bie et al, 1998b). The extensive use of physical applications may possibly be explained from the continued focus on pain reduction in all phases of treatment. As discussed above, however, it is questionable whether in later phases of treatment the choice of these interventions is adequate.

### **Clinical Implications**

The discrepancies found between theory and practice may stimulate physiotherapists to reconsider these aspects of their practice patterns. A possible method to minimise such discrepancies is to guide physiotherapists towards appropriate treatment patterns by developing and implementing practice guidelines (Lazar0 and Fitch, 1996; Hendriks et al, 1996). In the Netherlands, a practice guideline for examination and treatment of patients with lateral ankle sprains has been recently published (De Bie et al, 1998b), which is a first step towards more appropriate practice by Dutch physiotherapists.

## CONCLUSIONS

This study has identified points of correspondence and non-correspondence between theory and practice. For patients with a lateral ankle sprain a moderate degree of correspondence was found between actual treatment and the assumptions on expected treatment of these patients. On the one hand, we found that bandaging and exercise therapy are important parts of treatment. Therefore, the current practice patterns are considered appropriate regarding these essential aspects of treatment. On the other hand, the emphasis on the reduction of disability was less than expected, especially in the last phase of treatment, and the use of ultrasound and shortwave for these patients was not in accordance with the assumptions. In order to stimulate Dutch physiotherapists to change the latter aspects of their treatment patterns, the implementation of a practice guideline concerning examination and treatment of these patients may be a practical tool.

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## TABLES AND FIGURES

**Table 1: Assumptions on expected treatment of patients with lateral ankle sprains**

<i>Aspect of treatment</i>	<i>Assumption</i>
<b>General characteristics</b>	
1. Treatment goals	<p><i>1.1 Reduction of impairments</i></p> <p>Main treatment goals are to reduce pain and swelling, and to improve impaired functions, especially stability of the joint.</p> <p><i>1.2 Reduction of disabilities</i></p> <p>A large part of treatment is aimed at a reduction of disabilities in mobility, in sports and work or household activities.</p>
2. Interventions	<p>Physiotherapists frequently apply a bandage or tape for these patients, combined with other interventions, especially exercise therapy, instructions for exercises and advice on rules for daily living.</p>
<b>Phasing of treatment</b>	
3. Treatment goals	<p><i>3.1 Impairments</i></p> <p>Treatment phase A (days 0-3) primarily aims at a reduction of pain and swelling. Improvement of impaired functions are given specific emphasis in phases B and C (day 4 to 3 weeks).</p> <p><i>3.2 Disabilities</i></p> <p>Attention to reduction of disabilities starts in phase B (days 4-10), and further increases in the later phases of treatment (day 10 to 8 weeks).</p>
4. Interventions	<p><i>4.1 Bandaging</i></p> <p>The ankle joint is bandaged or taped during phases B and C (day 4 to 3 weeks).</p> <p><i>4.2 Exercise therapy and instructions</i></p> <p>The role of exercise therapy increases from phase B (days 4-10) to phase D (3-8 weeks). In phases C and D, much emphasis is also placed on instructions for exercises.</p> <p><i>4.3 Giving advice</i></p> <p>Advice on rules for daily living continues during all phases of treatment.</p>
5. Longer treatment	<p>After 8 weeks, in some patients additional attention is given to treatment goals regarding performance in sports and work activities.</p>

**Table 2: Percentage of patients by age in ankle group and reference group**

<i>Age (years)*</i>	<i>Ankle group (n = 251)</i>	<i>Reference group (n = 16,801<sup>†</sup>)</i>
0-14	1.6	2.7
15-24	33.1	10.9
25-34	24.7	18.7
35-44	16.7	20.5
45-54	11.2	17.7
55-64	7.6	13.2
65-74	4.4	9.7
75+	0.8	6.6

\* Significant difference between ankle group and reference group ( $P \leq 0.001$ ; Cramèr  $V = 0.09$ ).

<sup>†</sup> For 22 patients in the reference group, data on age were missing

**Table 3: Percentage of patients by duration of their complaints in ankle and reference groups**

<i>Duration of complaints*</i>	<i>Ankle group (n = 250<sup>†</sup>)</i>	<i>Reference group (n = 16,504<sup>††</sup>)</i>
0 - 10 days	44.0	19.2
11 days - 6 weeks	30.0	32.7
> 6 weeks	26.0	48.1

\* Significant difference between ankle and reference groups ( $P \leq 0.001$ ; Cramèr  $V = 0.08$ ).

<sup>†</sup> For one patient in the ankle group, data on duration of complaints were missing.

<sup>††</sup> For 319 patients in the reference group, data on duration of complaints were missing.

**Table 4: Percentage frequency of treatment goals\* regarding impairments, treatment goals regarding disabilities and interventions in ankle and reference groups**

	Ankle group (n = 251)		Reference group (n = 15,628**)		$r_s^{\dagger}$
	Mean	SD	Mean	SD	
<b>Treatment goal</b>					
Pain reduction	29.9	30.2	32.0	33.0	NS
Reduction of swelling	19.2	21.7	3.0	11.9	0.21 <sup>††</sup>
Improvement of stabilisation of joints	18.02	4.9	1.7	9.0	0.22 <sup>††</sup>
Recovery of range of motion	8.8	17.5	18.8	26.4	-0.05 <sup>††</sup>
Improvement of muscle force	8.0	15.7	6.1	17.2	0.04 <sup>††</sup>
Regulation of muscle tone	1.7	8.3	18.1	26.4	-0.09 <sup>††</sup>
Improvement of posture	0.4	4.2	3.8	13.2	-0.04 <sup>††</sup>
Allevation of other impairments	14.0	23.5	16.2	28.4	NS
Mobility	44.8	44.1	14.2	33.0	0.12 <sup>††</sup>
Work/household	16.6	32.6	35.8	46.0	-0.04 <sup>††</sup>
Sports/hobbies	13.8	30.4	5.0	20.4	0.07 <sup>††</sup>
Self-care	0.1	0.2	1.4	10.4	NS
Physical control	1.9	9.3	4.7	18.8	NS
Other activities	1.4	11.2	3.5	17.1	-0.02 <sup>††</sup>
<b>Intervention</b>					
Exercise	23.1	19.9	19.9	23.2	0.03 <sup>††</sup>
Massage	13.4	16.3	24.7	22.9	-0.06 <sup>††</sup>
Bandaging	11.8	16.4	0.4	3.4	0.35 <sup>††</sup>
Ultrasound	14.3	15.6	7.0	14.8	0.09 <sup>††</sup>
Shortwave	6.7	13.3	3.0	10.0	0.06 <sup>††</sup>
Instruction (home exercise)	11.4	14.7	9.4	14.7	0.02 <sup>††</sup>
Advice (living rules)	1.7	5.2	1.6	5.3	NS
Interferential	5.0	11.6	6.2	14.1	NS
Manual therapy	2.5	9.8	11.3	20.1	-0.07 <sup>††</sup>
Heat and cryotherapy	0.7	4.2	2.9	9.5	-0.03 <sup>††</sup>
Diadynamic <sup>‡</sup> current	0.8	4.6	0.5	4.6	NS
Others	8.7	9.2	13.1	15.3	-0.03 <sup>††</sup>

\* Percentages refer to the relative occurrence of the specific treatment goal or intervention to total treatment

<sup>†</sup> Strength of association between specific treatment goal or intervention and patient group (ankle group versus reference group).

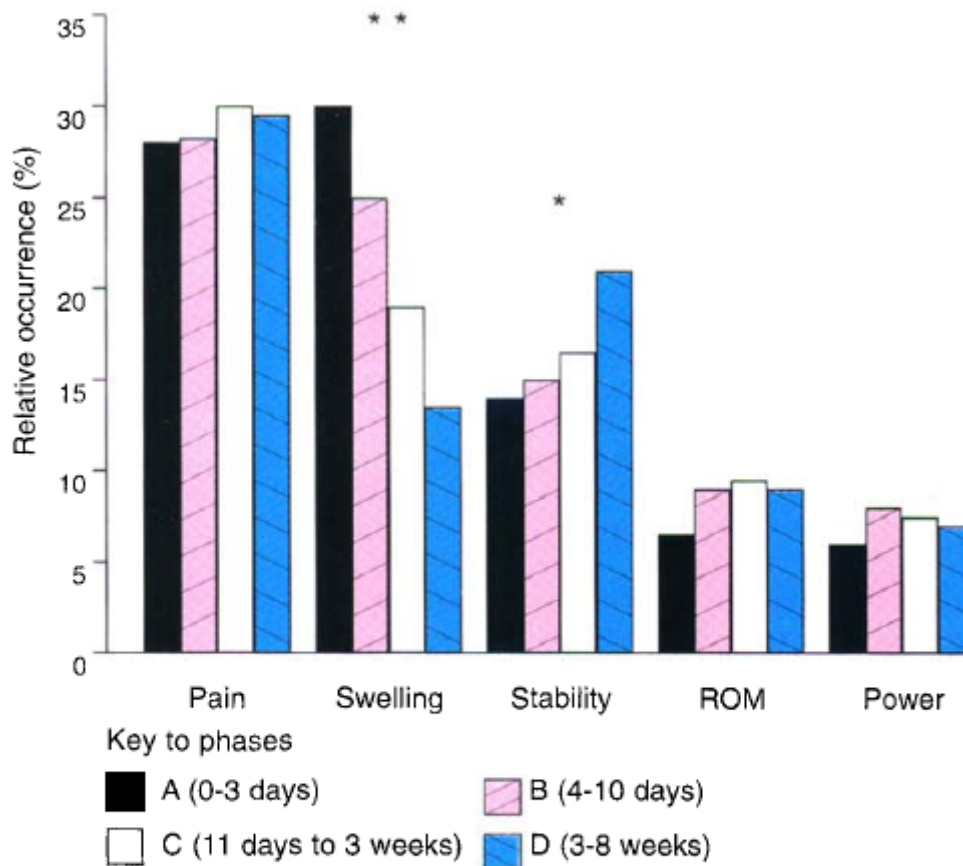
<sup>‡</sup> A form of electrical stimulation

\*\* For 1,195 patients in the reference group data on treatment goals and interventions were missing.

NS Not significant

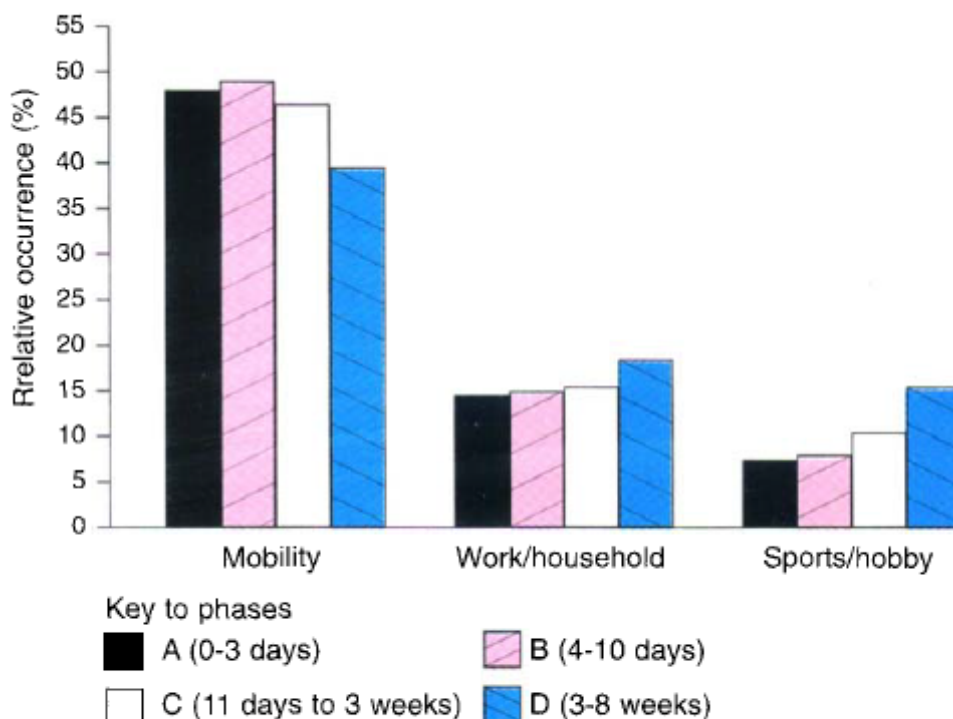
<sup>††</sup> Significant difference between ankle group and reference group ( $P \leq 0.01$ ).

<sup>†††</sup> Significant difference between ankle group and reference group ( $P \leq 0.001$ ).

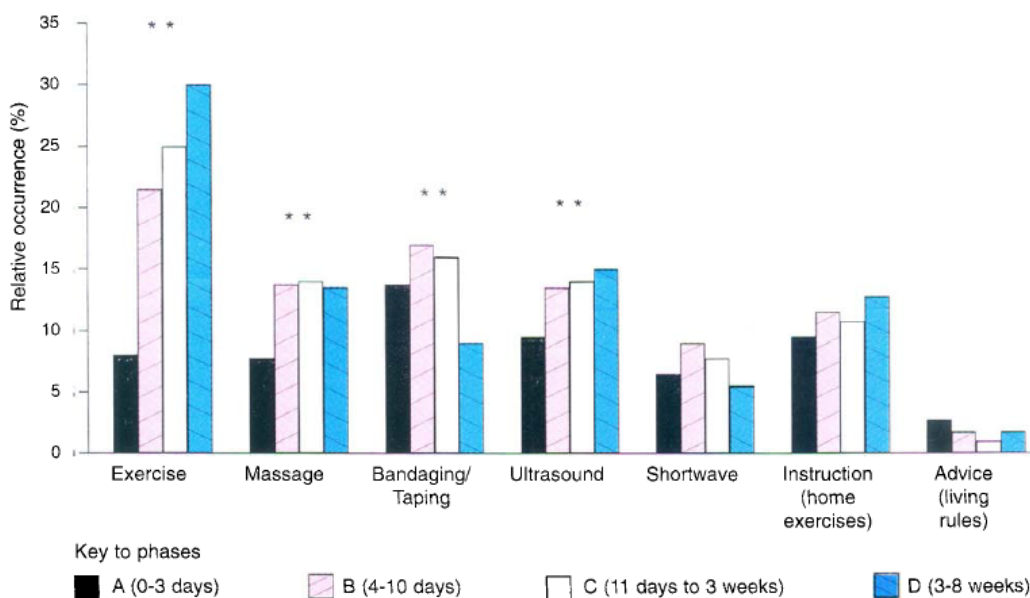


\* Significant difference between phases ( $P \leq 0.01$ )  
\*\* Significant difference between phases ( $P \leq 0.001$ )

**Fig 1: Relative occurrence of treatment goals regarding impairments in four phases of treatment (n = 233)**



**Fig 2: Relative occurrence of treatment goals regarding disabilities in four phases of treatment (n = 233). For 18 patients in the ankle group, data on treatment goals in one phase were missing**



\*\* Significant difference between phases (p < 0.001)

**Fig 3: Relative occurrence of interventions in four phases of treatment (n = 251)**