Effect of different orthotic concepts as first line treatment of plantar fasciitis

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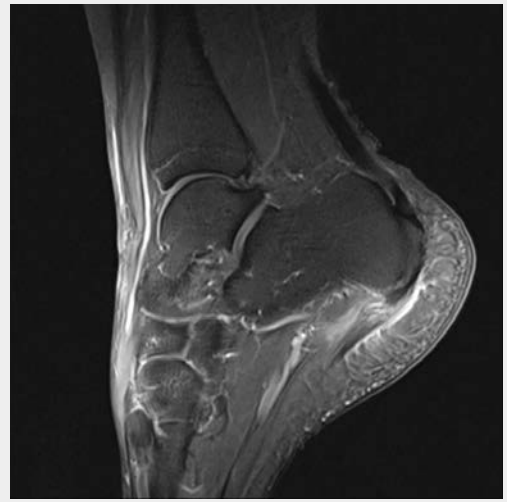

Introduction

- Plantar fasciitis is a painful degenerative disease of the insertion the plantar fascia
- The plantar fascia is a
  - thick fibrous band of connective tissue
  - originating on the bottom surface of the calcaneus (heel bone)
  - extending along the sole of the foot towards the five toes

- Plantar fasciitis is caused by
  - a loss of elasticity of the plantar fascia over time
  - mechanical overload of the fascial structures in the insertion point at the anterior calcaneus.

Cheung JT, Zhang M, An KN. Effects of plantar fascia stiffness on the biomechanical responses of the ankle-foot complex. Clin Biomech (Bristol , Avon) 19: 839-46, 2004.

MRI in acute plantar fasciitis

Risk factors for plantar fasciitis

- high sports activity
- forefoot pronation
- high pressure under the forefoot,
- shortening of the heel cord
- increased body mass index (BMI)
- pes planovalgus and/or pes cavus

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2. Irving DB, Cook JL, Young MA, Menz HB. Obesity and pronated foot type may increase the risk of chronic plantar heel pain: a matched case-control study. BMC Musculoskelet Disord 8: 41, 2007.
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Treatment concepts

In more than 80% of patients, the symptoms disappear within a year regardless of the chosen course of therapy.

- goal of conservative treatment is
- to reduce pain
- shorten the duration of disease

Conservative treatment options:

- Stretching exercises
- Cold applications
- NSAIDs
- Orthotics

Treatment concepts

Mechanical concepts of orthotics

- hindfoot cushioning
- hind foot stabilization
- medial midfoot support

The purpose of this study was to compare three of the most common mechanical orthotic concepts in a prospective, randomized, controlled, head-to-head study.

1. Chia KK, Suresh S, Kuah A, Ong JL, Phua JM, Seah AL. Comparative trial of the foot pressure patterns between corrective orthotics,formthotics, bone spur pads and flat insoles in patients with chronic plantar fasciitis. Ann Acad Med Singapore 38: 869-75, 2009.
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3. Kripke C. Custom vs. prefabricated orthoses for foot pain. Am Fam Physician 79: 758-9, 2009.
4. Seligman DA, Dawson DR. Customized heel pads and soft orthotics to treat heel pain and plantar fasciitis. Arch Phys Med Rehabil 84: 1564-7, 2003.

Material and Methods

- 30 consecutive patients (21 women, 9 men)
- Diagnosis of plantar fasciitis (clinical + MRI)
- Registered at the German Register for Clinical Trials (DRKS00000742)
- Orthotics as single treatment for 3 weeks
- Exclusion criteria included:
  - Previous surgery in the area of the heel
  - Injection treatments within the last six months
  - Inflammatory joint diseases
  - Neurological diseases
  - Metabolic disorders
  - Foot deformities that required earlier treatment

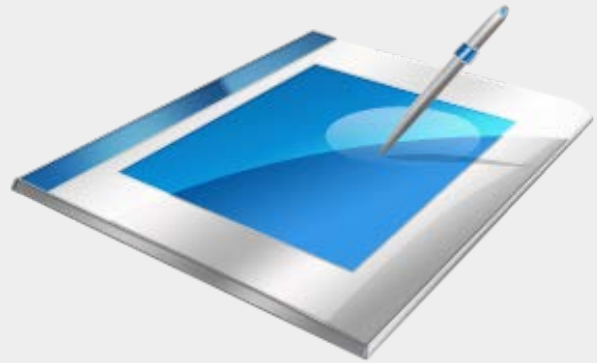
- Three branches with different orthotics
- Patients randomly assigned to one of the three branches of therapy

Demographics of the three groups

	age (ø ± SD)	Male/ female	BMI (ø ±SD)	Pain in weeks (ø ± SD)	Usage time of the orthotics [h/ day] (ø ± SD)	Shoes used
Group 1	51,6 ±12,5	2/8	27,4 ±2,9	8,6 ±4,9	8,8 ±3,9	6 Business shoe 2 Comfort shoe 2 Safety shoe
Group 2	53,8 ±13,2	3/7	27,4 ±3,9	10,7 ±7,5	9,1 ±2,9	7 Business shoe 2 Comfort shoe 1 Safety shoe
Group 3	53,9 ±14,9	4/6	28,7 ±5,0	9,7 ±4,5	8,7 ±3,4	7 Business shoe 1 Comfort shoe 2 Safety shoe
	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Material and Methods

- Three weeks daily documentation of
  - Maximal pain (VAS)
  - Average pain (VAS)
  - Duration of pain
  - Hours of usage of the orthotics
  - Type of shoes used
  - Daily walking distance



Group 1

- Thin, prefabricated, over-the-counter (OTC) orthotic
- Insert base is made of polyethylene (PE)
- Cushion under the heel and forefoot are made of thin polyurethane (PU)
- Besides trimming for sizing purposes, no further adjustments are possible
- Internet product (www.fersenschmerz.de)

Group 2

- Soft foam insert
- Padded heel
- Voluminous basis made of EVA (Ethylene Vinyl Acetate)
- Layered, recessed polyurethane cushion zone.
- Individualization possible by an orthopedic technician
- Springer

Group 3

- Insert with a thin self-supporting plastic core with a central plantar heel recess
- plantar fanning in combination with two layers of PU padding
- The cushion layer with different resilience
- Customization by an orthopedic technician is possible
- Bauerfeind AG (Professional Ferse)

Statistics

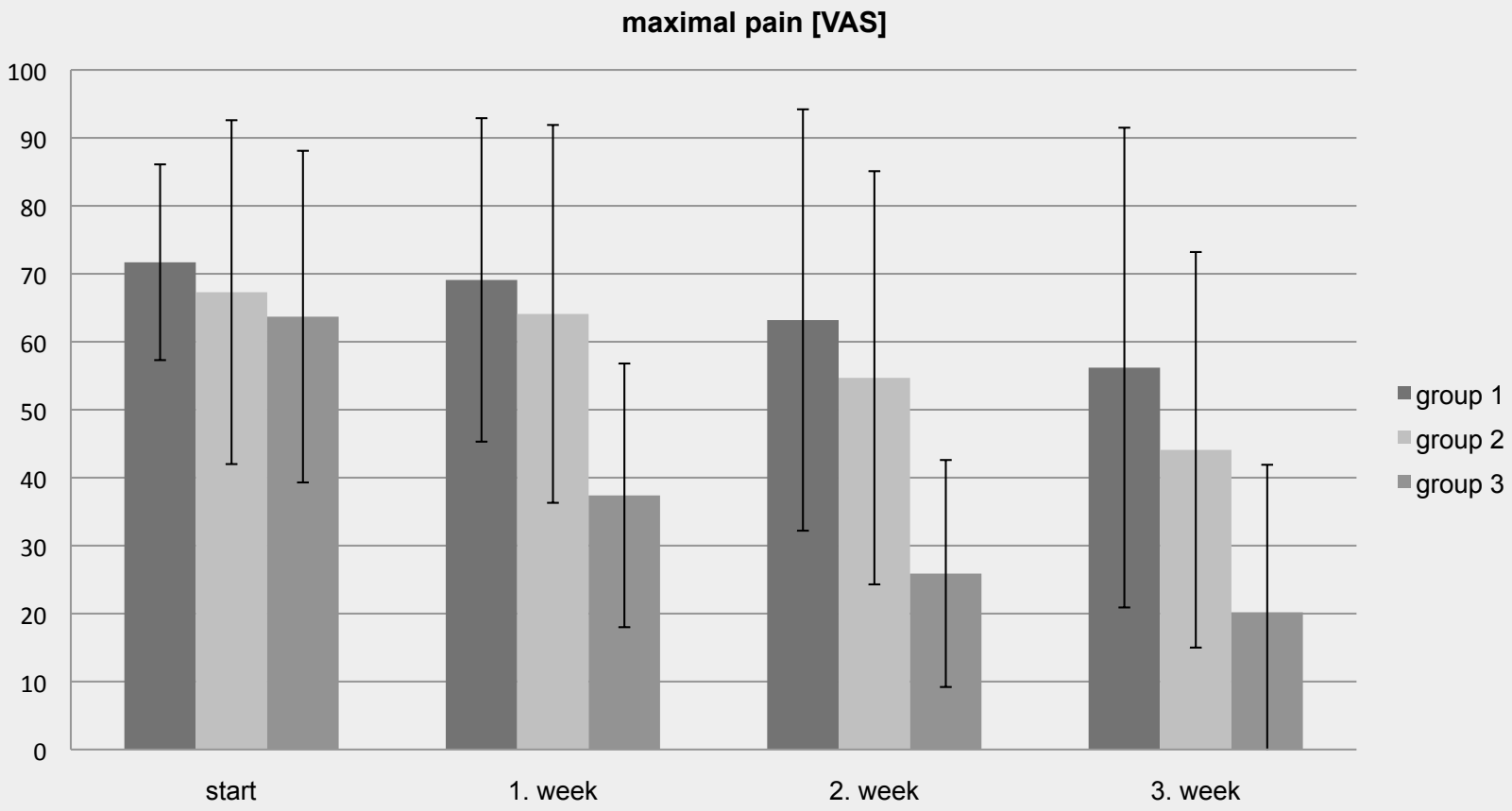
- Levene's test, an inferential statistic used to assess the equality of variances
- Analysis of Variance (ANOVA) to compare the means of the groups
- The post hoc analysis was used to identify significant differences between the groups
- T-test for dependent samples and Wilcoxon signed-rank test were to analyze therapeutic effects over time.

Results

	Prior to treatment		After 1st week of treatment		Wilcoxon Test	After 2nd week of treatment		Wilcoxon Test	After 3rd week of treatment		Wilcoxon Test
	max. ± SD	ø ± SD	max. ± SD	ø ± SD	Chance to baseline value after 1 week of treatment	max. ± SD	ø ± SD	Chance to baseline value after 2nd week	max. ± SD	ø ± SD	Chance to baseline value after 3rd week of treatment
Group 1	71,7 ± 14,4	47,1 ± 13,6	69,1 ± 23,8	52,5 ± 22,1	p=0,683	63,2 ± 31,0	49,1 ± 31,1	p=0,415	56,2 ± 35,3	46,0 ± 33,9	p=0,173
Group 2	67,3 ± 25,3	35,8 ± 14,8	64,1 ± 27,8	38,8 ± 23,5	p=0,407	54,7 ± 30,4	29,8 ± 19,0	p=0,059	44,1 ± 29,1	20,3 ± 20,1	p=0,009
Group 3	63,7 ± 24,4	43,7 ± 16,2	37,1 ± 19,4	28,6 ± 16,7	p=0,008	25,9 ± 16,7	17,4 ± 12,7	p=0,005	20,2 ± 21,7	15,6 ± 14,9	p=0,005

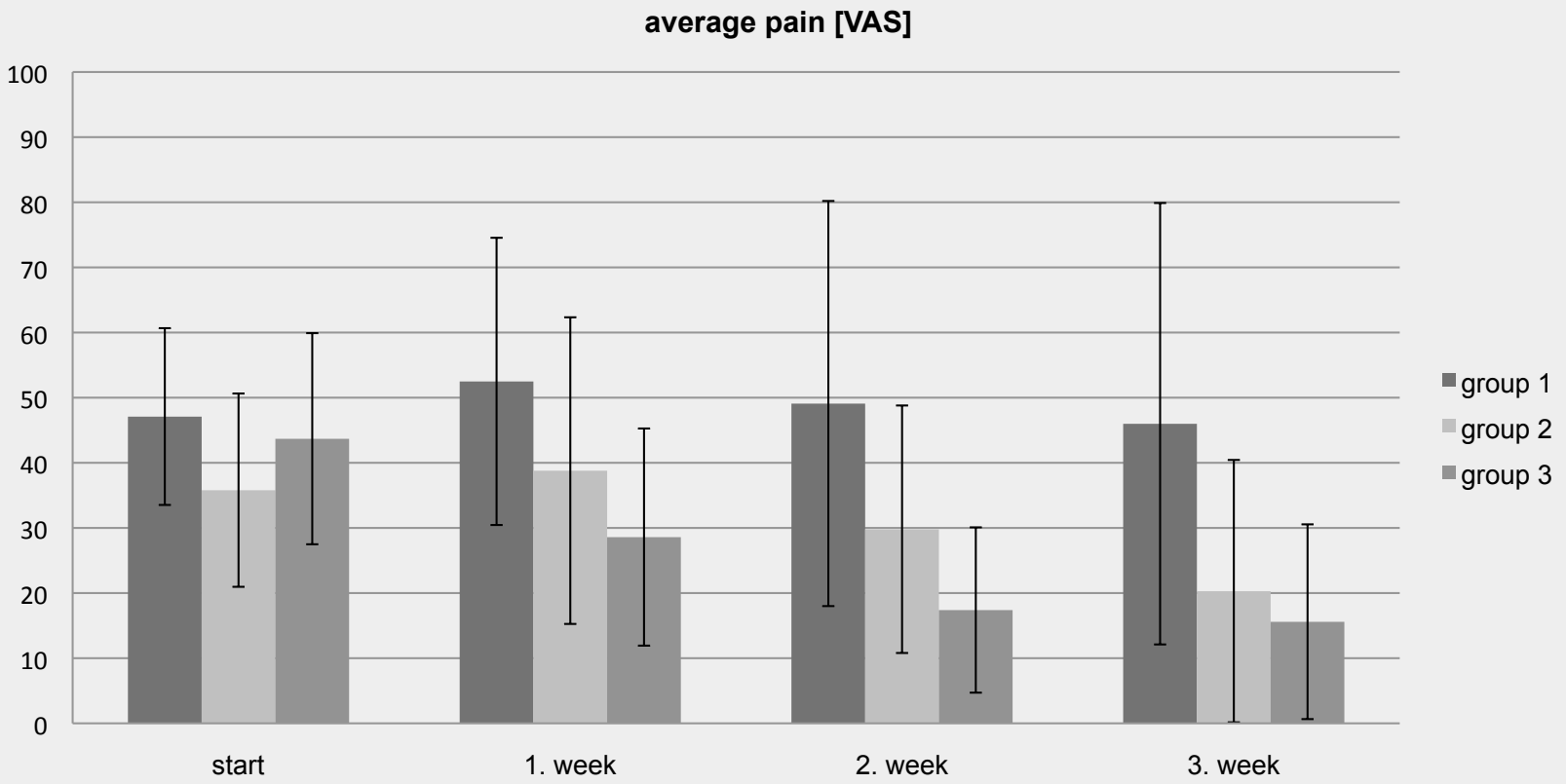
Results

- A significant ($p<0,05$) reduction in the maximal pain level was observed in group 2 and 3.



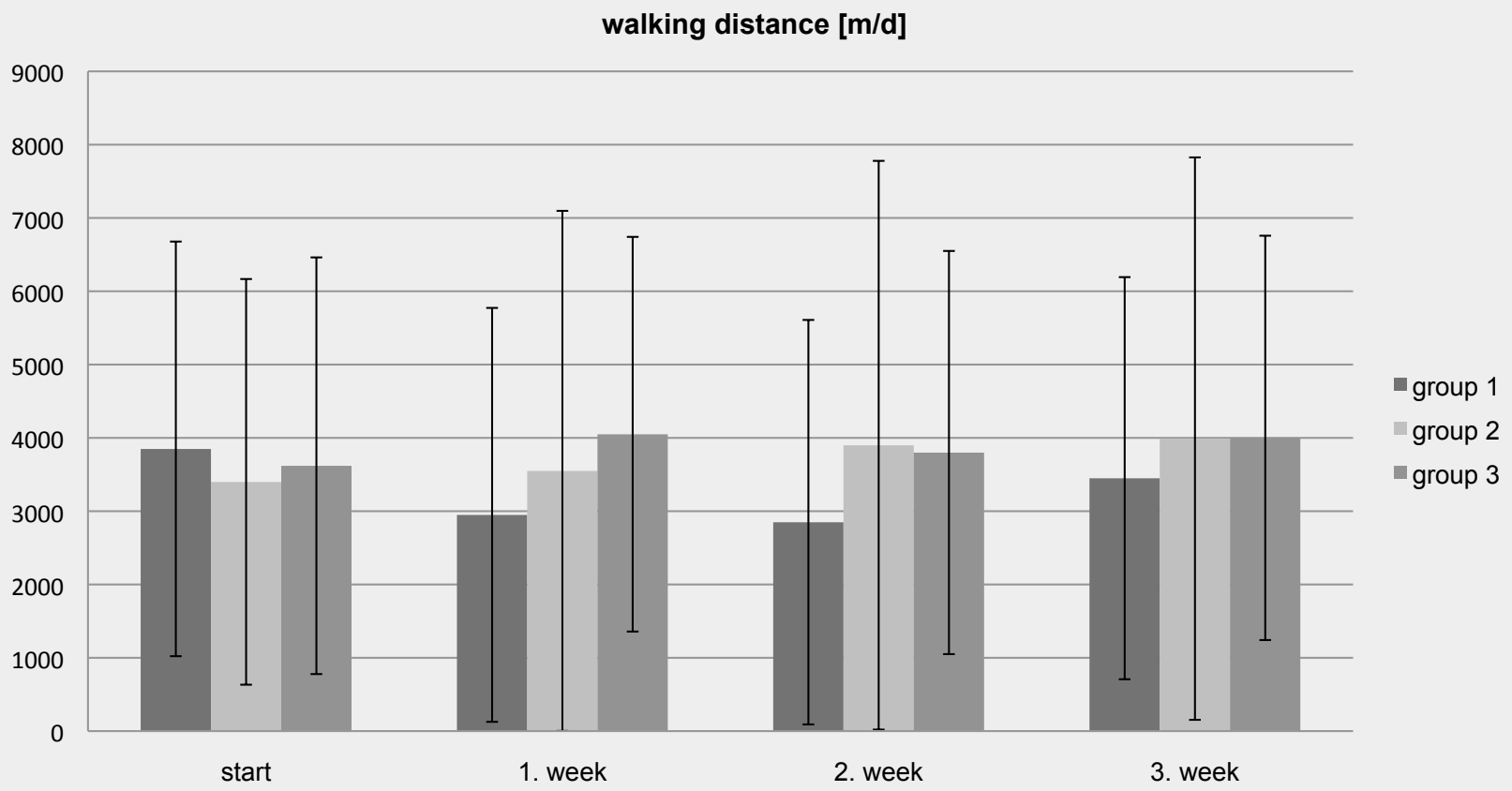
Results

- A significant ($p<0,05$) reduction in the average pain level was observed in group 2 and 3.
- The effect in group 3 was already significant after 1 week



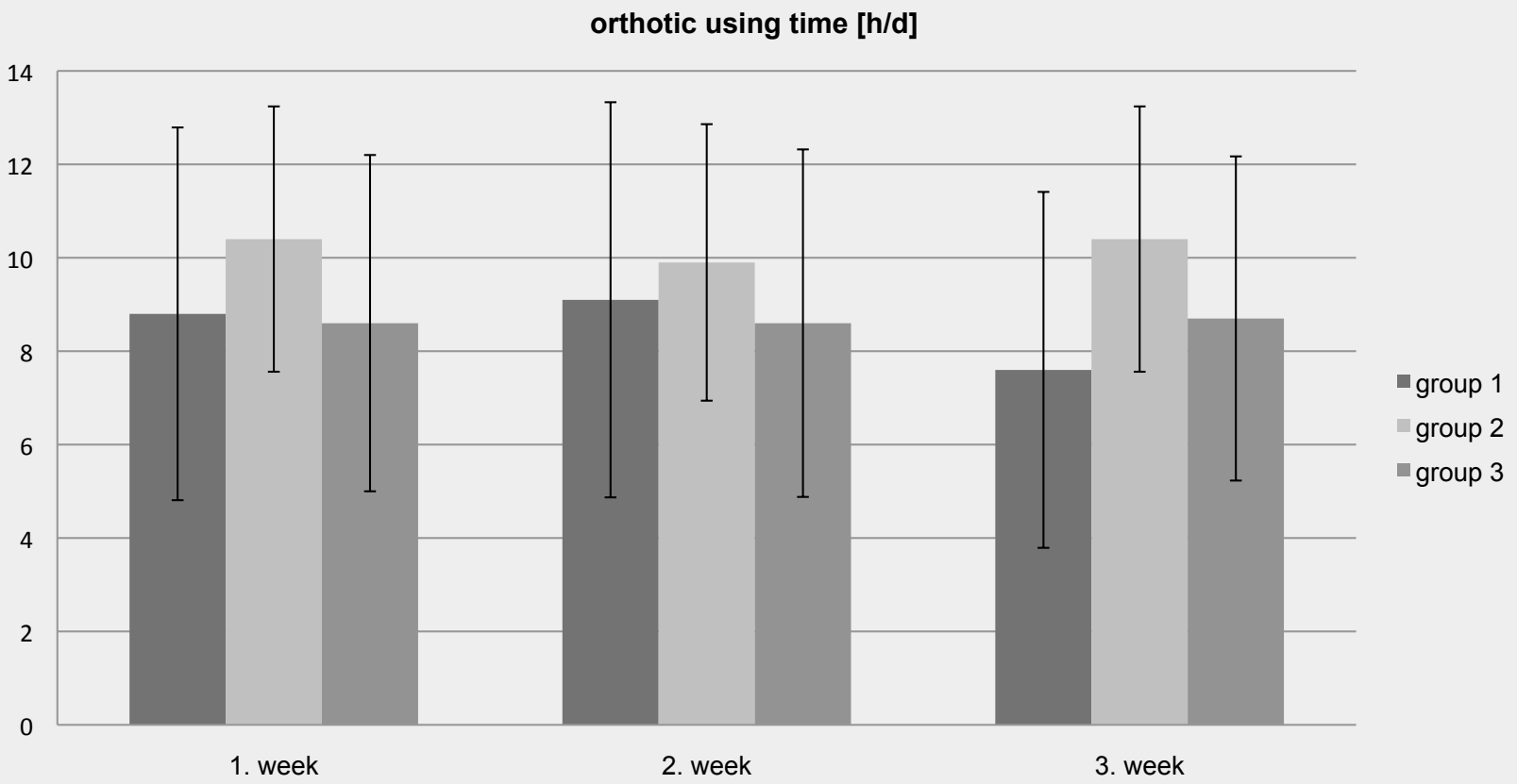
Results

- The improved pain level was not associated with an increased walking distance.



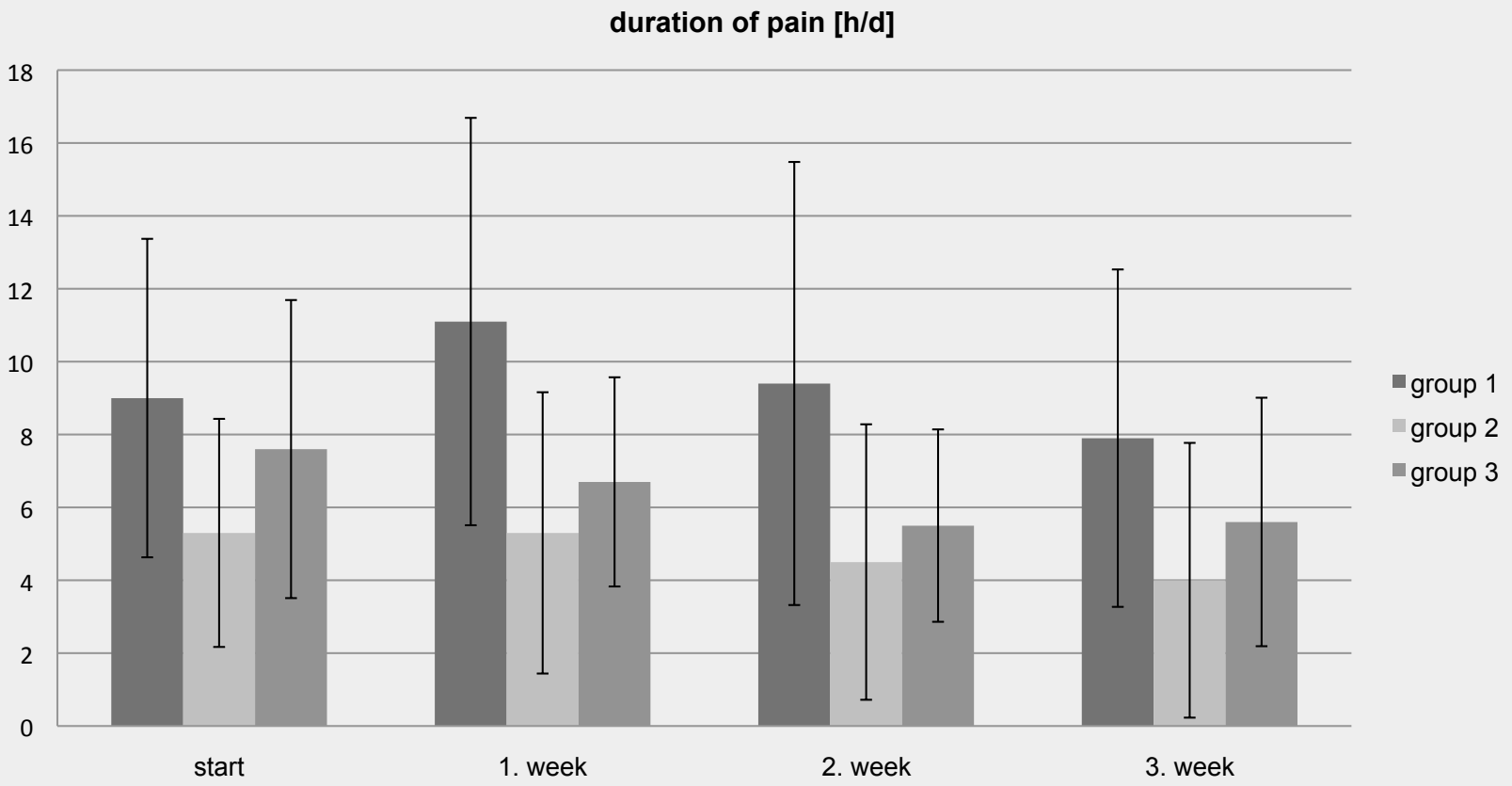
Results

- There was no significant difference in the orthotic using time between the three groups



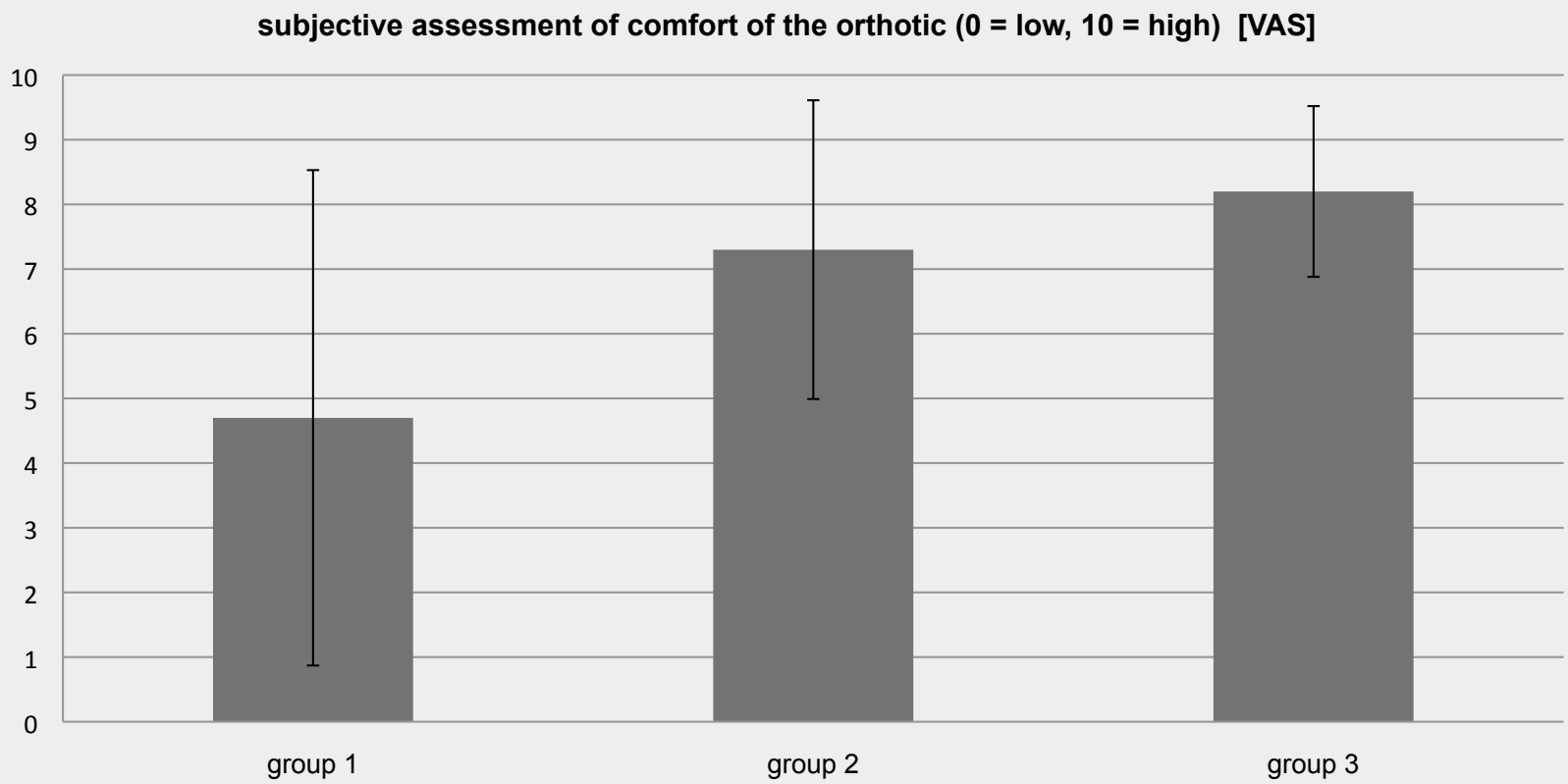
Results

- The duration of pain per day was not affected by the use of orthotics.



Results

- Thin PU-orthotics provide a significant ($p<0,05$) lower comfort than thick polyethylen orthotics or cantilever core orthotics.



Conclusion

- All orthotics investigated caused a reduction in the maximum and average pain level – however the pain reduction was not significant for the thin PU-orthotic.
- The additional mechanical approach implimented by the cantilever core orthotics seems to accelerate the onset of pain reduction.
- Thin PU-orthotics provide a significant ($p<0,05$) lower comfort than thick polyethylen orthotics or cantilever core orthotics.

- Thin PU-orthotics are inferior in the first line treatment of plantar fasciitis regarding pain reduction and patient comfort, compared to thick polyethylen orthotics or cantilever core orthotics.

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