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Dyna Ankle

Quality for life

Clinical Study Summaries

This document summarizes clinical studies conducted with the Dyna Ankle. The included studies were identified by a literature search made on PubMed and within the journals *Hefte zur Unfallheilkunde*, *Orthopädieschuhtechnik*, *Schweiz. Zeitschr. Sportmed.*, *Sportverletzung – Sportschaden*, *Orthopädische Praxis*, and *Medizinisch Orthopädische Technik*.

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Table of content:

1 Overview table

The summaries are organized in three levels depending on the detail of information. The overview table (Level 1) lists all the relevant publications dealing with a particular product (topic) as well as researched categories (e.g., gait analysis, clinical effects, satisfaction, etc.). By clicking on underlined categories, a summary of all the literature dealing with that category will open (Level 2).

For those interested to learn more about individual studies, a summary of the study can be obtained by clicking on the relevant reference (Level 3).

Reference		Category						
		Functions and Activities						Participation
Author	Year	Biomechanics – Static measures	Biomechanics – Gait analysis	X-Ray	EMG	Functional tests	Clinical effects	Satisfaction
Matussek	2000		X			X		X
Total number: 1		0	1	0	0	1	0	1

2 Summaries of categories

On the following pages, you find summaries of categories researched in several studies (e.g. gait analysis, clinical effects, satisfaction, etc.). At the end of each summary, you will find a list of reference studies contributing to the content of the particular summary.

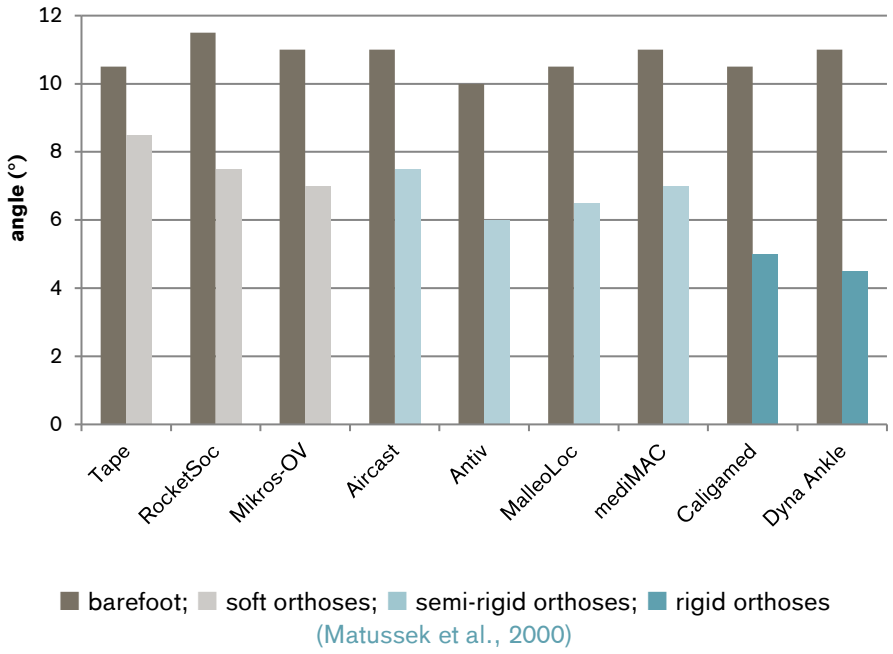
Functional tests / Biomechanics (deep jump)

Major Findings

With Dyna Ankle:

→ highest reduction (6.7° or 60.5%) of supination angle of all competitor orthoses in comparison to barefoot situation

Mean reduction of supination angle in comparison to barefoot situation



(Matussek et al., 2000)

Clinical Relevance

The literature shows the advantages of early functional therapy over conservatively immobilizing therapy in the treatment of injured ankle ligaments (Lohrer, 1990; Dahners et al., 1989; Wetz et al., 1987; Zwipp, 1986; Zwipp et al., 1988). Tension tests of the outer ligaments showed that they are only slightly tensioned in the range of of 10° dorsal extension and 20° plantar flexion. Orthoses should therefore not only have an antisupinatory effect, but also limit plantar flexion beyond 20° (Wirth et al., 1978). Sufficient scarring of injured structures is only possible if maximum stress on the scar is avoided while maintaining moderate stress stimuli. (Segesser et al., 1986)

Summary

Matussek et al. (2000) analyzed eight orthoses available on the market and one tape bandage with regard to their protective abilities during the supination stimulus, which was triggered in the landing phase after a deep jump. The orthoses were divided into three groups according to their design characteristics:

1. In the soft orthoses, the reduction of the supination angle is approx. 30%, whereby the mode of action is mainly to be interpreted by stimulating the proprioceptive protective reflexes.
2. The semi-rigid orthoses offer an average 39% reduction in the supination angle due to their mechanical stabilizers.
3. The rigid orthoses have an antisupinatory effect and only allow plantar flexion up to approx. 10°-15°. This makes them suitable for the functional treatment of acute rupture of the outer ligaments.

The result of the evaluation of the ankle foot orthoses was not unexpected. Dynamic, sudden supination events are not completely prevented by any of the tested splints (Scheuffelen et al., 1993; Segesser et al., 1986).

The maximum reduction effect of approx. 61% was achieved with the Dyna Ankle from the group of rigid orthoses. Due to their design, they are also able to prevent plantar flexion of more than 20°, which is why they can be used in the acute treatment of external ligament injuries. (Matussek et al., 2000)

References of summarized studies

Matussek, J.; Bröcker, L.; Mellerowicz, H.; Neff, G. (2000). Sprunggelenksorthesenprüfung unter Einsatz eines neuen plyometrischen Testverfahrens – Versuchsbeschreibung und Analyse der Daten. Testing ankle orthoses by means of a new plyometric technique. *Medizinisch Orthopädische Technik*, 120: 72-81.

Other References

Dahners, L. E.; Torke, M. D.; Gilbert, J. A.; Lester, G. E. (1989). The effect of motion on collagen synthesis and fiber orientation during ligament healing. 35th Annual Meeting, Orthopaedic Research Society, Las Vegas, Nevada

Lohrer, H. (1990). Mittelfristige Ergebnisse operativ versorgter lateraler Kapselbandrupturen am oberen Sprunggelenk – ein Vergleich immobilisierender und funktioneller Nachbehandlung. *Orthopädische Praxis* ,26:675-679.

Scheuffelen, C.; Gollhofer, A.; Lohrer, H. (1993). Neuartige funktionelle Untersuchungen zum Stabilisierungsverhalten von Sprunggelenksorthesen. *Sportverletzung – Sportschaden,* 7: 30-36.

Segesser, B.; Jenoure, P.; Feinstein, R.; Vogtsartori, S. (1986). Wirkung äußerer Stabilisationshilfen bei fibulärer Distorsion. *Orthopädieschuhtechnik,* 7: 342-363.

Wetz, B.; Steffen, R.; Raemy, H.; Jakob, R. P. (1987). Spätergebnisse nach konservativer Therapie fibulotalarer Bandläsionen mit der Aircastschiene. *Scheweiz. Zeitschr. Sportmed.,* 35: 115-118.

Wirth, C. J.; Küsswetter, W.; Jäger, M. (1978). Biomechanik und Pathomechanik des oberen Sprunggelenkes. *Hefte zur Unfallheilkunde* 131: 10-22.

Zwipp, H. (1986). Die anterolaterale Rotationsinstabilität des Oberen Sprunggelenks. *Hefte zur Unfallheilkunde* 177.

Zwipp, H.; Tscherne, H.; Hoffmann, R.; Thermann, H. (1988). Riß der Knöchelbänder: Operative Versorgung oder konservative Behandlung. *Deutsches Ärzteblatt* 42: 2897-2902.

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Satisfaction

Major Findings

With Dyna Ankle:

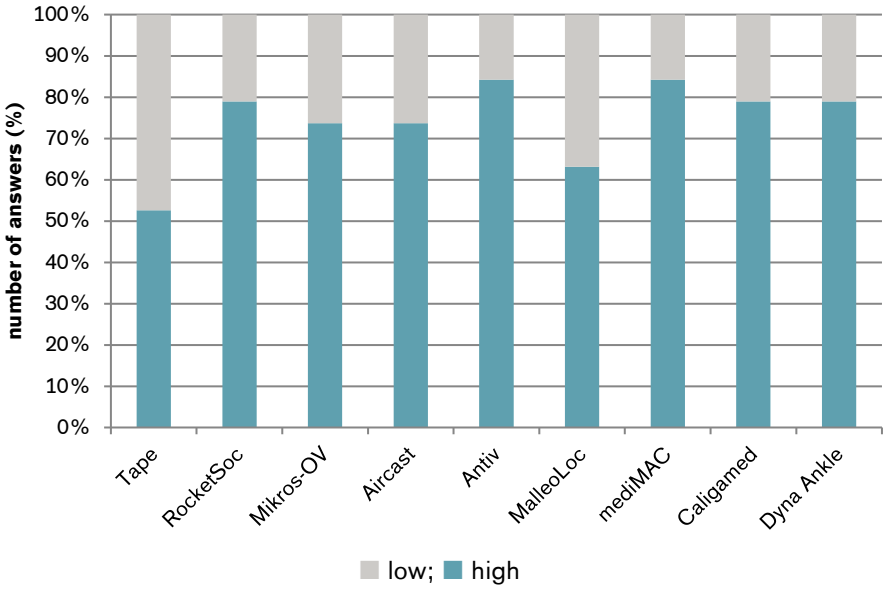
→ high sense of security in 15 of 19 subjects

→ good wearing comfort in 16 of 19 subjects

→ easy to learnable handling in 18 of 19 subjects

→ low to moderate feeling of restriction in 15 of 19 subjects

Perceived sense of security



(Matussek et al., 2000)

Clinical Relevance

Satisfaction can be measured to determine the general well-being of a person and the fulfilment of his expectations to the medical device. It is a very meaningful parameter to investigate since it has a direct impact on the patient's well-being and compliance. It is influenced by additional categories and can therefore be seen as a summary of possible pain reduction and better performance of ADLs.

Additionally, the patients' satisfaction is also correlated with the usage of the medical device. Studies on the non-use of devices suggest that, on average, a third of all devices provided are not used (Scherer 2002). The lack of consumer involvement or consumer dissatisfaction with the device were shown as predictors of non-use (Wielandt & Strong, 2000). In addition, a number of problems have been identified as reasons for non-use: inadequate performance of the product; poor function of the product; difficulty in operating the product; and the high cost of the products and their maintenance (Batavia & Hammer 1990, Goodacre & Turner, 2005). Obtaining user perspectives is therefore fundamental to address these issues.

Summary

Each of the orthoses tested gives most test persons a sense of safety. As expected, this is often described as "high" in the rigid and semi-rigid orthoses.

As expected, wearing comfort with soft and semi-rigid orthoses was also described more frequently as “hardly irritating”. Within the group of rigid orthoses, the Dyna Ankle offers clearly higher wearing comfort.

The handling of the Dyna Ankle was predominantly assessed as “easy” 8/19 and “learnable” 10/19. The bandage and the stirrup orthoses were most frequently rated as “easy”.

Likewise, the result on the feeling of limitation was as expected. The soft orthoses were most frequently rated as "low" and the rigid orthoses as "moderate" to "strong". Within the group of rigid orthoses, the Dyna Ankle also shows clear advantages here. (Matussek et al., 2000)

References of summarized studies

Matussek, J.; Bröcker, L.; Mellerowicz, H.; Neff, G. (2000). Sprunggelenksorthesen-prüfung unter Einsatz eines neuen plyometrischen Testverfahrens – Versuchsbeschreibung und Analyse der Daten. Testing ankle orthoses by means of a new plyometric technique. *Medizinisch Orthopädische Technik*, 120: 72-81.

Other References

Batavia, A. I.; Hammer, G. S. (1990). Toward the development of consumerbased criteria for the evaluation of assistive devices. *Journal of rehabilitation research and development*, 27(4): 425-436.

Goodacre, L.; Turner, G. (2005). An investigation of the effectiveness of the Quebec user evaluation of satisfaction with assistive technology via a postal survey. *British Journal of Occupational Therapy*, 68(2): 93-96

Scherer, M. J. (2002). The change in emphasis from people to person: introduction to the special issue on Assistive Technology. *Disability and rehabilitation*, 24(13): 1-4.

Wielandt, T.; Strong, J. (2000). Compliance with prescribed adaptive equipment: a literature review. *The British Journal of Occupational Therapy*, 63(2): 65-75.

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3 Summaries of individual studies

On the following pages, you find summaries of studies that researched Dyna Ankle. You find detailed information about the study design, methods applied, results and major findings of the study. At the end of each summary, you also can read the original study authors' conclusions.

Reference

Matussek, J.; Bröcker, L.; Mellerowicz, H.; Neff, G.;

Orthopädische Universitätsklinik und Polyklinik der Freien Universität Berlin.

Testing ankle orthoses by means of a new plyometric technique

Sprunggelenksorthesenprüfung unter Einsatz eines neu entwickelten plyometrischen Testverfahrens – Versuchsbeschreibung und Analyse der Daten

Medizinisch Orthopädische Technik 2000, 120: 72-81

Products

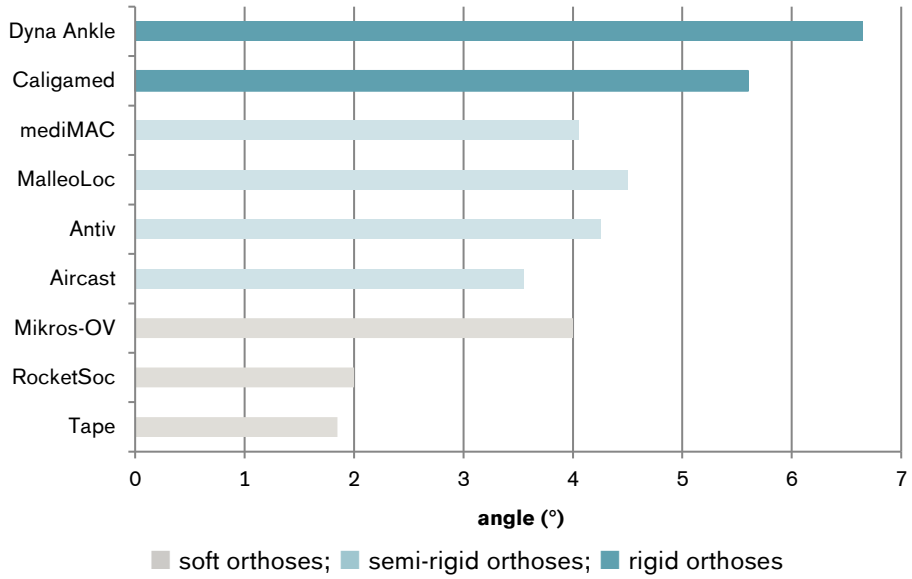
Dyna Ankle (Ottobock); Caligamed, MalleoLoc (Bauerfeind); mediMAC, RocketSoc (medi); Antiv (Röck); Aircast (Aircast); Micros-OV (Warncke); Tape

Major Findings

With Dyna Ankle:

→ highest reduction (6.7° or 60.5%) of supination angle of all competitor orthoses in comparison to barefoot situation

Mean reduction of supination angle in comparison to barefoot situation



→ high sense of security in 15 of 19 subjects

→ good wearing comfort in 16 of 19 subjects

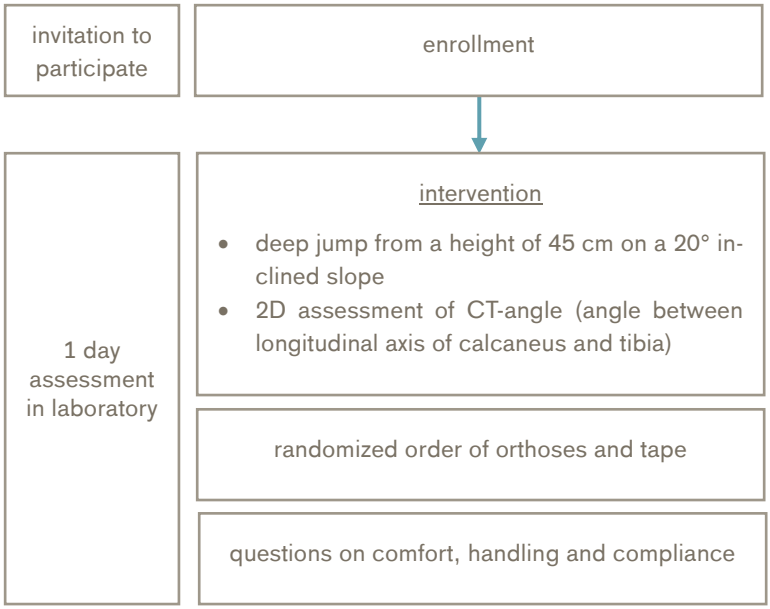
→ easy to learnable handling in 18 of 19 subjects

→ low to moderate feeling of restriction in 15 of 19 subjects

Population	Subjects:	19 (14 male, 5 female) 10 healthy, 9 with known supination trauma
	Mean age:	29.0 ± 4.7 years (range 19-40 years)

Study Design

Randomized crossover design with intra-individual control:



Results

Functions and Activities | Participation

Biomechanics – Static measures | Biomechanics – Gait analysis | X-Ray | EMG | **Functional tests** | Clinical effects | **Satisfaction**

Category	**Outcomes**	**Results for Dyna Ankle and competitor products**	**sig.***
Functional tests – deep jump	Supination angle	Reduction of supination angle due to intervention compared to barefoot situation	n.a.

	Reduction (°)	Reduction (%)
Dyna Ankle	6.7	60.5
Caligamed	5.6	53.3
mediMAC	4.1	36.8
MalleoLoc	4.5	42.9
Antiv	4.3	42.5
Aircast	3.6	32.3
Mikros	4.0	36.4
RocketSoc	2.0	17.4
Tape	1.9	17.6

Category	Outcomes	Results for Dyna Ankle and competitor products	sig.*
Satisfaction	Sense of security	Findings from the survey of the subjects regarding the orthoses. The number of answers is shown.	n.a.

	high	low
Dyna Ankle	15	4
Caligamed	15	4
mediMAC	16	3
MalleoLoc	12	7
Antiv	16	3
Aircast	14	5
Mikros	14	5
RocketSoc	15	4
Tape	10	9

	Wearing comfort	Findings from the survey of the subjects regarding the orthoses. The number of answers is shown.	n.a.

	hardly irritating	somewhat irritating	irritating
Dyna Ankle	6	10	3
Caligamed	1	6	12
mediMAC	12	6	1
MalleoLoc	11	7	1
Antiv	9	9	1
Aircast	15	4	0
Mikros	10	7	2
RocketSoc	10	6	3
Tape	15	4	0

	Handling during donning and doffing	Findings from the survey of the subjects regarding the orthoses. The number of answers is shown.	n.a.

	easy	learnable	difficult
Dyna Ankle	8	10	1
Caligamed	9	9	1
mediMAC	8	9	2
MalleoLoc	7	9	3
Antiv	15	4	0
Aircast	16	3	0
Mikros	10	9	0
RocketSoc	9	10	0
Tape	3	13	3

Category	Outcomes	Results for Dyna Ankle and competitor products				sig.*
	Feeling of restriction	Findings from the survey of the subjects regarding the orthoses. The number of answers is shown.				n.a.
			low	moderate	strong	
		Dyna Ankle	7	8	4	
		Caligamed	1	9	9	
		mediMAC	9	10	0	
		MalleoLoc	10	9	0	
		Antiv	7	11	1	
		Aircast	15	4	0	
		Mikros	17	2	0	
		RocketSoc	16	3	0	
		Tape	16	3	0	
	Would you wear the orthosis for a longer time?	Findings from the survey of the subjects regarding the orthoses. The number of answers is shown.				n.a.
			yes	reluctantly	no	
		Dyna Ankle	3	7	9	
		Caligamed	0	6	13	
		mediMAC	11	8	0	
		MalleoLoc	7	10	2	
		Antiv	5	12	2	
		Aircast	12	7	0	
		Mikros	10	6	3	
		RocketSoc	11	7	1	
		Tape	11	8	0	

* no difference (0), positive trend (+), negative trend (–), significant (**++/––**), not applicable (n.a.)

Author's Conclusion

"The plyometric (retrograde standing jump) test procedure for determining the protective effect of ankle joint orthoses has the advantage of simulating the supination stress situation as far as possible. Eight commonly available braces and classical taping were analysed in view of observing the supination that occurs during landing. The orthoses of the rigid group effectively have the most favourable absolute protective effect, whereby wearing comfort of the Caligamed has to be significantly reduced compared to the Dyna Ankle." (Matussek et al. 2000)

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