



Experimental research on the ground reaction force when performing a drop jump on different kinds of artificial turf

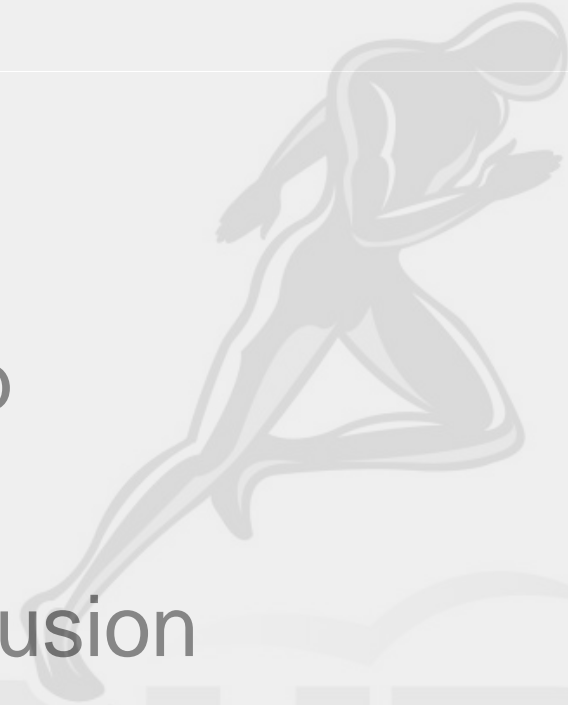
R. Verhelst, P. Malcolm, P. Verleysen, J. Degrieck,
D. De Clercq, R. Philippaerts



Sport Surfaces Research Forum

Overview

- introduction
- goal
- experimental setup
- results
- discussion & conclusion

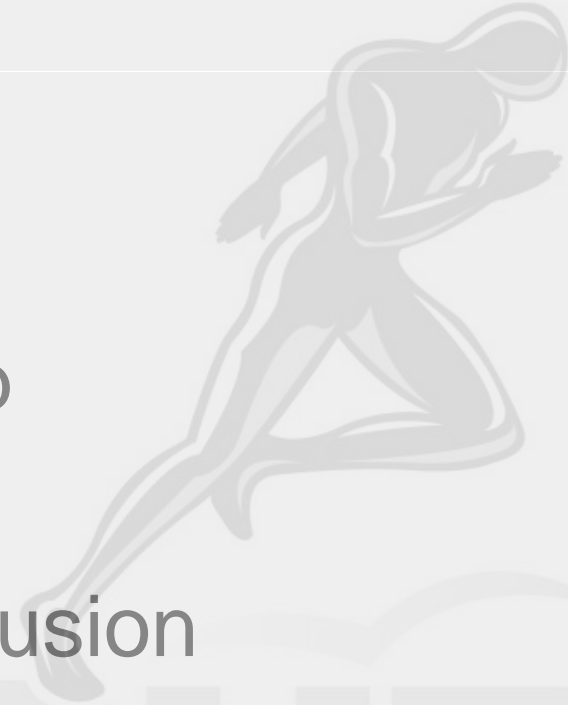


SPORTSURIF

Sport Surfaces Research Forum

Overview

- **introduction**
- goal
- experimental setup
- results
- discussion & conclusion

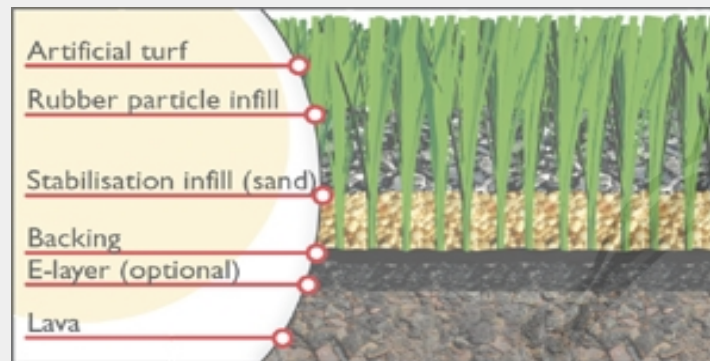


SPORTSURIF

Sport Surfaces Research Forum

Introduction

- 3rd generation artificial turf: increased use in football



- new types of infill:
 - enhancing performance
 - minimising injury rates

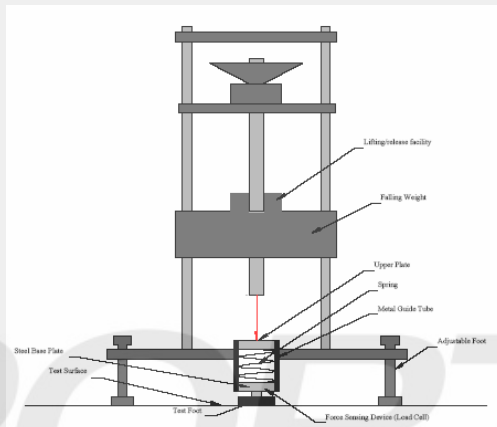
Introduction

- shock absorption
 - jumping for headers, keeper landing, running, ...
 - joint & back injuries



Introduction

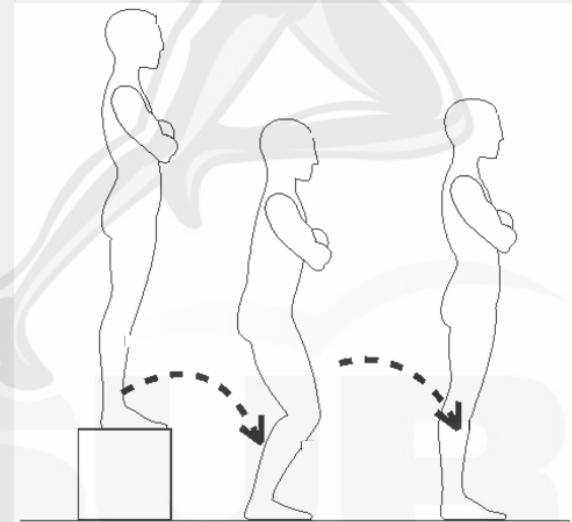
- mechanical testing
 - Artificial Athlete/ AAA force reduction



- + reproducible
- representative of player-surface interaction?

Introduction

- biomechanical testing
 - drop jump
 - ground reaction force
 - kinematics
 - + more realistic
 - + additional information



Durá 1999

Sport Surfaces Research Forum

Overview

- introduction
- **goal**
- experimental setup
- results
- discussion & conclusion



SPORTSURIF

Sport Surfaces Research Forum

Goal

- comparison of 2 kinds of artificial turf (SBR and TPE infill)
- biomechanical testing
 - drop jump
 - ground reaction force measurement
- statistical analysis

Sport Surfaces Research Forum

Overview

- introduction
- goal
- **experimental setup**
- results
- discussion & conclusion

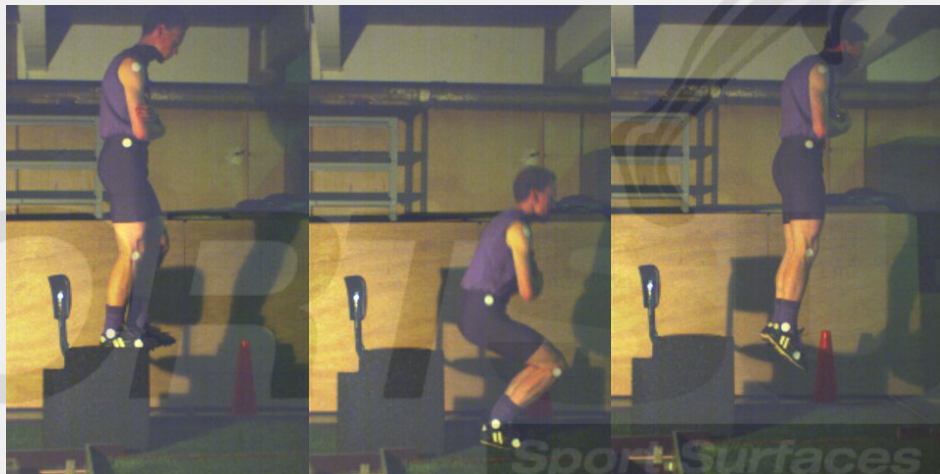


SPORTSURIF

Sport Surfaces Research Forum

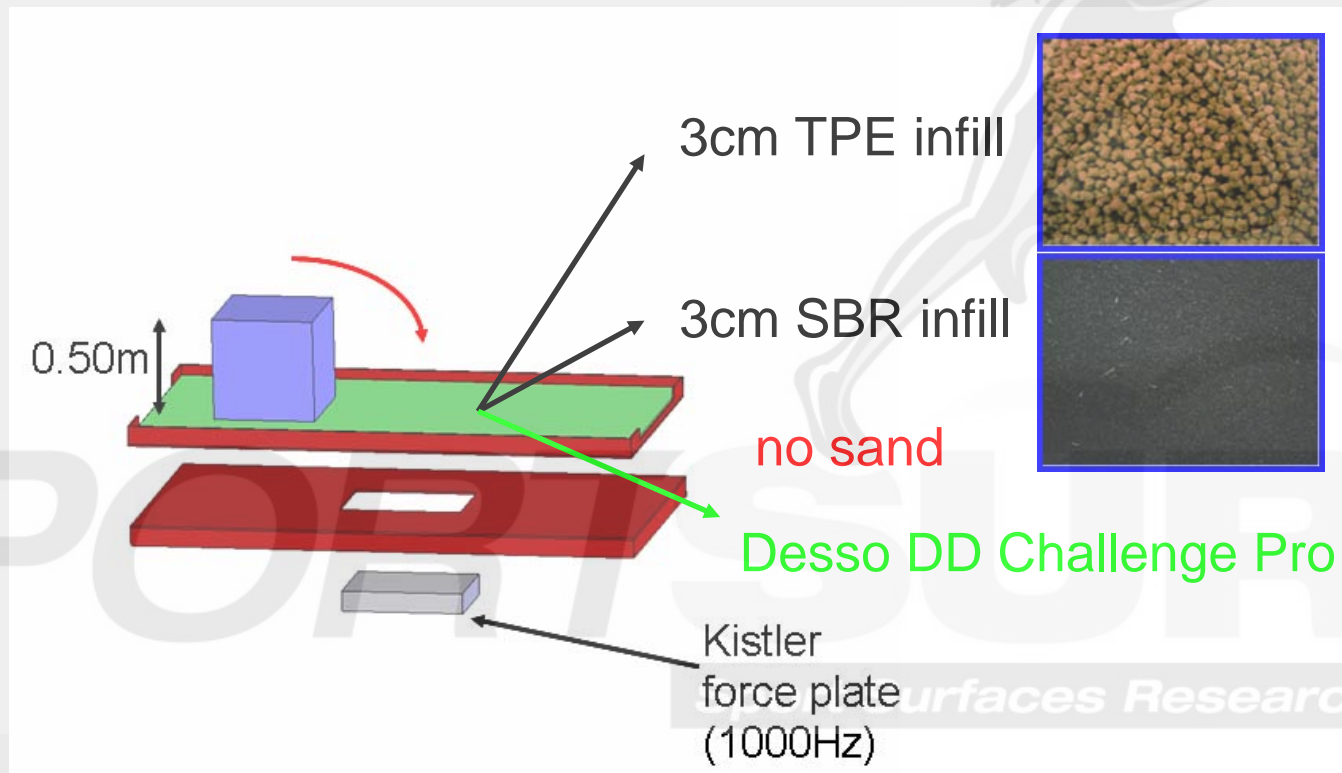
Experimental setup

- drop jump
 - subjects: 7 recreational football players
 - 5 jumps on 2 surfaces



Experimental setup

- ground reaction force measurement



Overview

- introduction
- goal
- experimental setup
- **results**
- discussion & conclusion

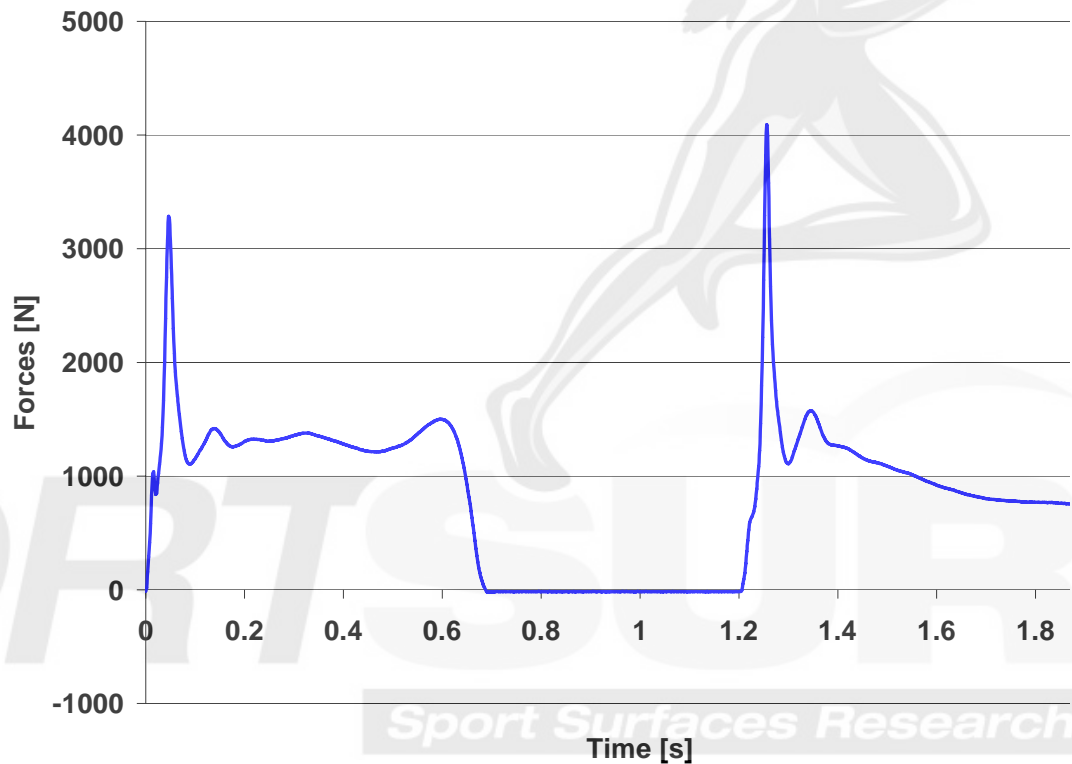


SPORTSURIF

Sport Surfaces Research Forum

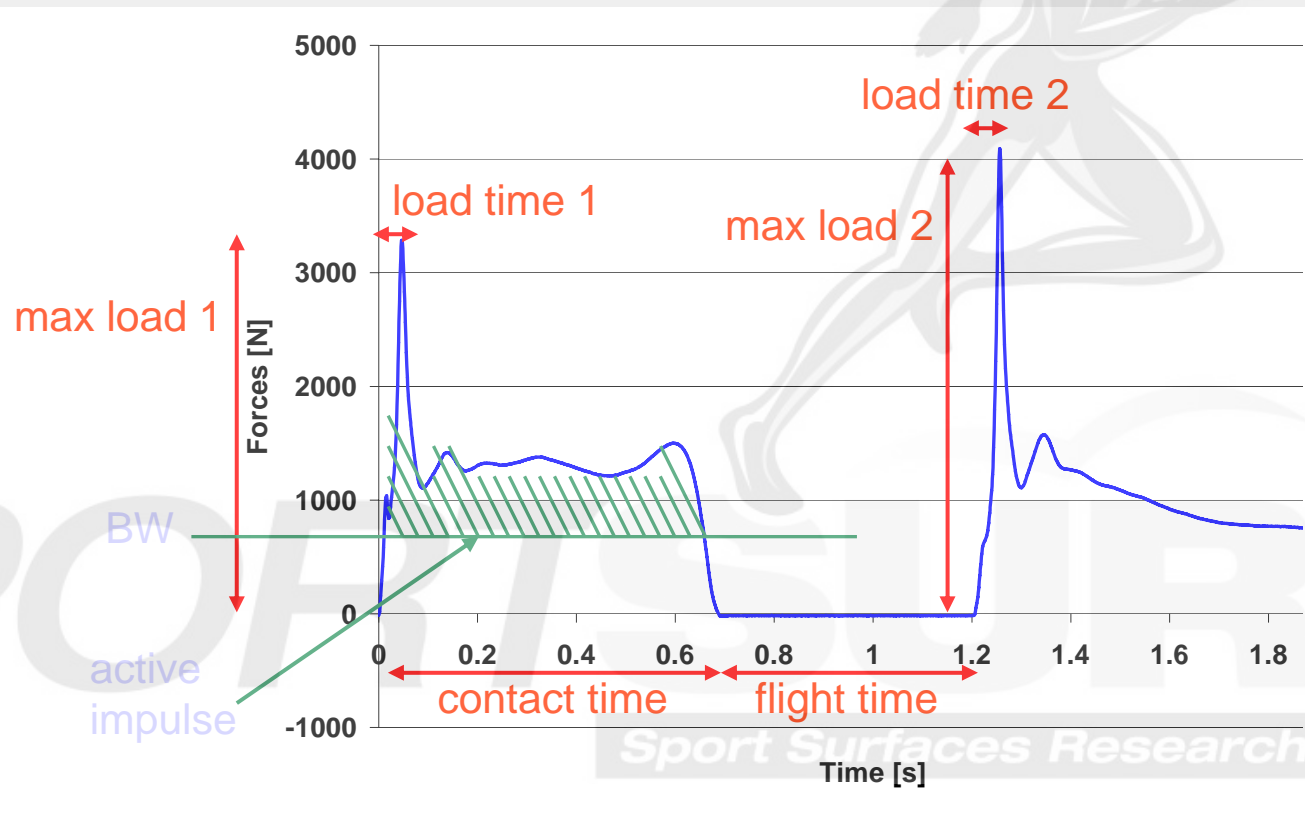
Results

- GRF: ground reaction force



Results

- GRF: analysed variables



Results

- GRF: statistical analysis (SPSS 12)

	<i>TPE infill</i>	<i>SBR infill</i>	<i>correlation r (ICC)</i>		
	<u><i>AVERAGE</i></u>	<u><i>AVERAGE</i></u>	<i>TPE infill</i>	<i>SBR infill</i>	<u><i>p-value</i></u>
flight time [s]	0.497	0.499	0,955	0,954	1,000
load time 1 [s]	0.056	0.054	0,858	0,798	0,735
load time 2 [s]	0.058	0.062	0,686	0,733	0,128
contact time [s]	0.484	0.5	0,992	0,990	0,310
max load 1 [N]	2873	2724	0,857	0,756	0,866
max load 2 [N]	4067	3976	0,771	0,903	0,398
max LR Fz peak 1 [N/s]	166133	121850	0,807	0,797	0,237
av LR Fz peak 1 [N/s]	59326	54111	0,911	0,731	0,398
max LR Fz peak 2 [N/s]	319203	271608	0,716	0,775	0,091
av LR Fz peak 2 [N/s]	80239	70335	0,734	0,850	0,091
active impulse Fz [Ns]	354	359	0,636	0,969	0,612

Results

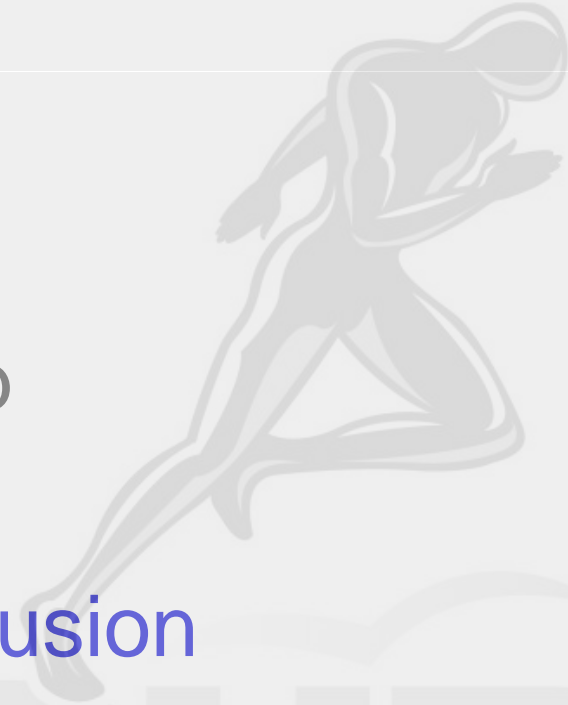
- GRF: statistical analysis (SPSS 12)

	<i>TPE infill</i>			<i>SBR infill</i>			<i>correlation r (ICC)</i>		
	<u>AVERAGE</u>		<u>STDEV</u>	<u>AVERAGE</u>		<u>STDEV</u>	<i>TPE infill</i>	<i>SBR infill</i>	<i>p-value</i>
max LR Fz peak 1 [N/s]	166133	±	85249	121850	±	29661	0,807	0,797	0,237
av LR Fz peak 1 [N/s]	59326	±	25085	54111	±	15901	0,911	0,731	0,398
max LR Fz peak 2 [N/s]	319203	±	145676	271608	±	127299	0,716	0,775	0,091
av LR Fz peak 2 [N/s]	80239	±	33683	70335	±	24804	0,734	0,859	0,091

load rate TPE > SBR

Overview

- introduction
- goal
- experimental setup
- results
- **discussion & conclusion**



SPORTSURIF

Sport Surfaces Research Forum



22/11/2006

Faculty of Engineering – IR04 Department of Mechanical construction and production.

Discussion & conclusion

- high repeatability: 20/22 parameters with $ICC > 0.7$
- no significant differences ($p < 0.05$)
- tendency to significant differences in load rate (2nd peak): $TPE > SBR$
- confirmed with AAA:
 - SBR: force reduction = 0.58
 - TPE: force reduction = 0.53

Discussion & conclusion

- explanation:
 - difference in material
 - difference in form
- risk of injuries on TPE **might** be higher than on SBR
- more tests needed to confirm tendency to significant difference

Sport Surfaces Research Forum

backup



SPORTSURIF

Sport Surfaces Research Forum



22/11/2006

Faculty of Engineering – IR04 Department of Mechanical construction and production.

Schokabsorptie en loopgedrag

- 4 typische voetbalbewegingen:
 - Start
 - Shuttle run
 - Landen
 - Bocht 90°
- 7 testpersonen
- 5 proeven per beweging op elk substraat

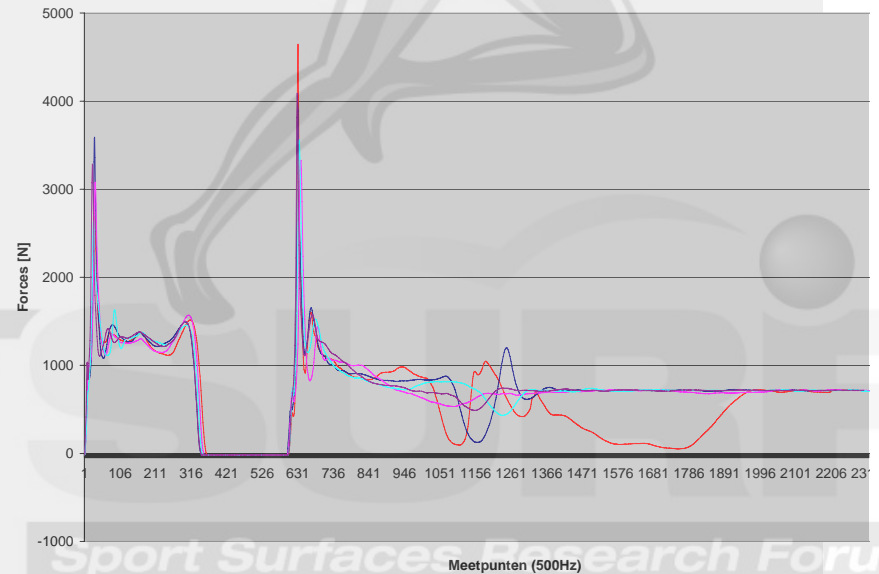


Schokabsorptie en loopgedrag

- Krachtmeetplatform

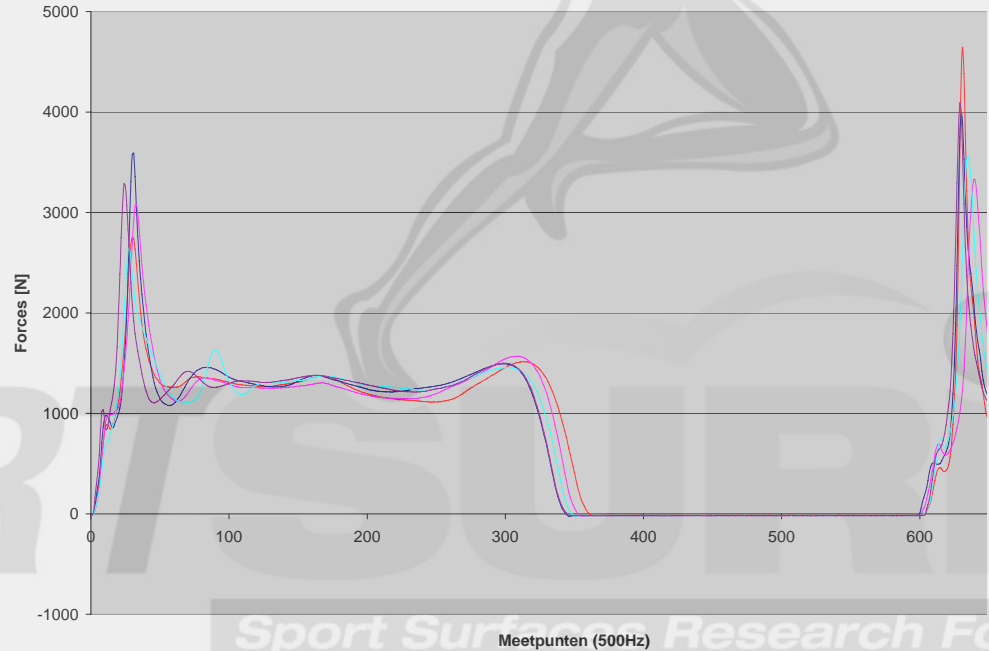
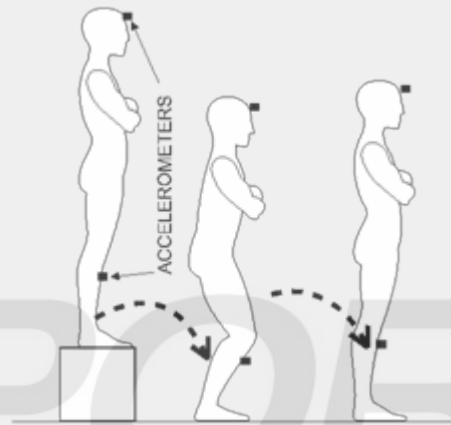
- F_x , F_y , F_z

- M_x , M_y , M_z



Schokabsorptie en loopgedrag

- Analyse vd krachtmetingen
 - Landen:



Schokabsorptie en loopgedrag

- Analyse vd krachtmetingen

- Landen:

