



R E P O R T

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**Assessment of the capacity of
NOENE[®] insoles to attenuate
vibrations during running**

On request of: **Laboratorios Diafarm S.A.**

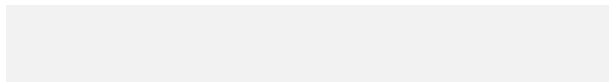
Date: 27 November 2012

SIGNATURES AND AGREEMENT CONDITIONS

Date: 27/11/12

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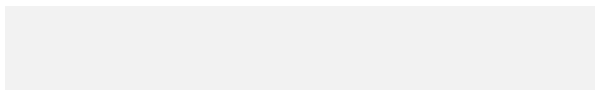
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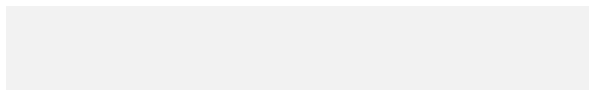
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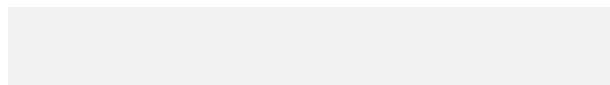
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AGREEMENT CONDITIONS

1. The Instituto de Biomecánica de Valencia (IBV) is only responsible for the results stated in this report, which refer exclusively to the materials or samples indicated in it and which will remain in our hands. Unless otherwise stated, the samples have been freely chosen and sent by the petitioner.
2. The IBV is not responsible in any case for the misinterpretation or misuse that can be done of this report, the reproduction of which, in its whole or part, with publicity purposes and without authorization from the IBV, is forbidden.
3. The results of this report are considered the petitioner's property and without his previous consent, the IBV will not communicate them to a third party.
4. The samples subject of this report will remain in the IBV during a period of six months beginning from the date of issue of this report. After this period, we will proceed to their destruction. Therefore, any claim must take place within the aforementioned period.

C o n t e n t s

SIGNATURES AND AGREEMENT CONDITIONS

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1. EXECUTIVE SUMMARY

Two NOENE[®] insoles of 1mm (SOS1) and 2mm (NO2) thickness were tested by 21 regular runners. Tests included both using them in their own running shoes during their weekly training sessions (subjective assessment) and using them in a pair of reference shoes during running series at the Human Movement Analysis Laboratory of IBV (subjective assessment and biomechanical measures).

The results obtained showed that NOENE[®] insoles can contribute to improve several biomechanical properties of running footwear, especially shock absorption capacity. 86% of runners decided to keep the insoles in their shoes after the tests.

Regarding the subjective assessment comparing blindly the two types of insoles with not wearing them:

- 86% of runners reported an improvement of the shock absorption of the footwear. Moreover, this improvement was found statistically significant ($p < 0.001$).
- 52% of runners reported an improvement of the overall comfort of the footwear. However, no statistical significance was found.
- No clear changes were reported by runners for footwear stability.
- No significant differences were found between the two types of NOENE[®] insoles (NO2 and SOS1) for any of the three properties enquired.

Regarding the objective assessment of biomechanical measurements:

- NOENE[®] insoles used under the original insole of the running shoes tested achieved an average reduction of the tibia impact between 0.6-0.8G, which is a ~5-6% reduction, compared to not using them.
- NOENE[®] insoles used under the original insole of the running shoes tested achieved an average cancelled 11% (SOS1) and 8% (NO2) of the high frequency content (beyond 30Hz) derived from the heel impacts during running.
- NOENE[®] insoles did not reduce nor increase the vertical ground reaction forces at the heel impact during running.
- No clear differences in shock absorption performance were found between the types of NOENE[®] insoles (SOS1 and NO2), in objective laboratory measurements.

2 BACKGROUND AND OBJECTIVES

2.1 BACKGROUND

Laboratorios Diafarm S.A. is preparing the distribution and commercialisation of footwear insoles made of NOENE[®] material (vibration absorber elastomer). This material has proven to show an excellent behaviour to attenuate vibrations and shocks in transportation and industrial environments.

Regarding **shock absorption**, previous tests (see Annexes) performed on test pieces of different shoe component materials (EVA, RUBBER and NOENE[®]) using free-falling steel ball and a load cell showed that NOENE[®] was able to reduce the impact forces by ~30% compared to RUBBER and ~17% compared to EVA.

Regarding **rebound elasticity and energy absorption**, previous tests (see Annexes) performed by measuring the rebound height of a free-falling steel ball (*Rebound Pendulum*) showed that from 0° to 30° 95% of the potential energy of the ball is dissipated by NOENE[®].

The limitation of these studies is that loadings, forces and accelerations involved in the shocks of a free-falling steel ball (100-200N) are much smaller than those involved in a foot step during running (1.000-2.000N).

2.2 OBJECTIVES

The company Laboratorios Diafarm S.A. wants to assess the capacity of NOENE[®] insoles to contribute to biomechanical performance of footwear and in particular to attenuate vibrations transmitted to the body during running.

To this end, two types of evaluations that involved the participation of experienced runners were proposed for this study:

- The assessment of the **biomechanical properties perceived** by runners when using NOENE[®] insoles (subjective perceptions).
- The assessment of the **biomechanical properties registered** in runners when using NOENE[®] insoles (objective measurements).

3. MATERIAL AND METHODS

3.1 INSOLE SAMPLES TO BE TESTED

Two different insole samples were provided by the company for the tests:

- 25 pairs of NOENE[®] SOS1 (1 mm thickness) insoles size 40-42 (fig. 1).
- 35 pairs of NOENE[®] NO2 (2 mm thickness and textile cover) insoles size 40-42 (fig. 2).



fig. 1: SOS1 insoles



fig. 2: NO2 insoles

3.2 SAMPLE OF RUNNERS INVOLVED IN THE TESTS

21 volunteer male runners participated in the tests.

Table 1 shows the characterisation of the sample of the participating runners. Runners were selected from different runners' associations and clubs of Valencia Region. The main selection criteria were: using running footwear size 42; performing regularly at least two running sessions per week of at least 45 minutes; and not being injured during the period of the tests.

Table 1: sample of runners

	Mean (Std. Dev.)
No. of participants	21
Body Weight(Kg)	72.9 (8.4)
Height (m)	1.74 (0.04)
Body Mass Index (Kg/m ²)	24.1 (2.9)
Training level (Km/week)	43.9 (23.1)

3.3 EVALUATION PROTOCOL

Prior to the testing sessions all runners followed a **clinical evaluation** of their foot and lower limb condition in order to discard any injury or condition that may bias the study.

For this study, two types of testing series were proposed for all the participants:

Long "at-home" tests:

Each runner tested the NO2 insole in their own running shoes during two weeks. After the trial period, runners filled in a questionnaire of perception.

Short "in-lab" tests:

Each runner performed several short running series at the Human Movements Laboratory of IBV with a pair of regular running shoes under three blind conditions (i.e. SOS1, NO2 and no insole). Different biomechanical variables were registered during the tests and after testing each sample, the user filled a questionnaire of perception.

3.3.1 Clinical Evaluation

A footcare specialist performed a clinical evaluation of the users' lower limb, carrying out an anamnesis, as well as a static assessment of the characteristics and morphology of their legs, ankles and feet, using exploration techniques and a podoscope for recording the foot plant's shape. The objective was to detect any pathology or abnormality on runners that would influence their performance. This information could be used to eliminate any runner not fitting the study criteria, and to contrast with the results of the biomechanical analysis.

First, the footcare specialist filled in the user's personal data, and then carried out an anamnesis, with their personal and podiatric antecedents. The usual running shoes of the user were analysed, namely any deformed and/or worn out parts, and some pictures were taken.

Second, a non weight-bearing exploration was carried out. The expert made an assessment of the lower limb joint ranges –hip, knees, ankles–, indicating whether these angles were above, below or within the normality ranges. Signs of hyperkeratosis on the foot plant and whether the foot was pronated or supinated were also explored and indicated (fig. 3).



fig. 3: Non weight-bearing exploration

Third, a weight-bearing exploration was carried out with the user standing up. The expert indicated whether different body segments were increased, diminished or equal. Within the same exploration stage, the expert made annotations for the different body views (frontal, dorsal, and lateral). In the frontal and dorsal views, the expert indicated the Relaxed Calcaneal Stance Position (RCSP) and the Neutral Calcaneal Stance Position (NCSP) angles obtained by means of goniometry, whether there were osseous protuberances, and whether the internal arch was increased or diminished according to the lateral view observations, among other annotations (fig. 4).

Fourth, user's footprint was analyzed by means of a podoscope, i.e. the presence or absence of overpressure areas, and the presence or absence of support of digital pads (fig. 5).



fig. 4: Weight-bearing exploration

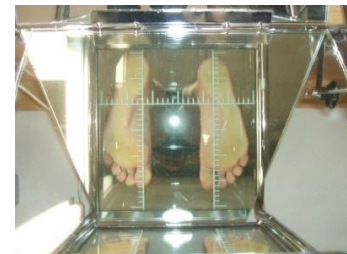


fig. 5: Footprint image with a podoscope

Finally, the expert gave a provisional diagnosis as a conclusion to the clinical evaluation. For more information, a brief record of the users' clinical exploration can be found on *Appendix A*.

3.3.2 Long “at-home” test series

A pair of NOENE’s NO2 insoles was introduced in the running shoes (fig. 6) of each of the 21 regular runners participating in the study. NO2 insoles were introduced under the original insole, with the textile lining side on top. Two of the participants used shoes with no removable insole, in that cases the NO2 insoles were placed on the original insole with the textile lining side on top. In all cases it was necessary to trim the contour of the NO2 insoles in order to fit the inner space of the shoes. Before giving back the shoes to the runners it was checked that the insole was not misplaced (i.e. no creases or folds).



fig. 6: Example of the shoes and insoles currently used by runners

Users filled in a questionnaire about the current biomechanical properties and preferences of their own footwear (i.e. shock absorption, stability, sole materials, perspiration and comfort). Questions were aimed at enquiring about the properties claimed to be provided by the insoles and basic biomechanical properties. This initial questionnaire can be found at the Annexes. They were also given the indications for the tests and were provided with the protocol of the tests (see annexes). The main indications were:

- Users should complete at least **four training sessions of at least 45 minutes** with the insoles within the two weeks of trial.
- Users were not allowed to take out the NO2 insoles during the trial period.
- Users should register the date, duration and the distance completed in each session, together with any feeling or sensation they may have.

After the trial period, runners came back to IBV to fulfil a questionnaire about the change of properties experienced and to give back the insoles (see Annexes). Questions were based on the initial questionnaire answered by runners before the trials. Insoles were taken out from the footwear and examined. All runners were offered to keep the insoles if they wanted to continue using them for their training sessions.

3.3.3 Short “in-lab” test series

For this test series four pairs of identical regular running shoes were used. The shoe model chosen was Kalenji EKIDEN50 (fig. 7). Each shoe sample was replaced after being used by 5 runners in short sessions.



fig. 7: regular running shoe used in the short in-lab test series

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Three different conditions were tested by each user:

- (a) No additional insole used
- (b) NOENE[®] NO2 insole under the original insole.
- (c) NOENE[®] SOS1 insole under the original insole.

Tests were blind to users; this means that they did not know which condition they were testing. Test order of the three conditions was randomized to avoid order end report effects.

The test consisted in the performance of at least five running series of 15-20 meters under each of the three conditions at a constant speed of at a fixed running speed of 5 min/Km (12 Km/h). Thus, two types of measurements were obtained from this test:

- **Subjective perception** of biomechanical properties obtained through questionnaires (see Annexes). First users were asked if they felt any trouble with the shoes. After testing each condition they were asked about their perception of the shock absorption,, stability and comfort provided by the footwear using a 5-point scale ranging from 'totally agree' to 'totally disagree' with the sentences proposed. After testing all conditions, users were asked to rank the three conditions from the best to the worst for the three properties tested.
- **Biomechanical measurements** (fig. 8) which included (a) the accelerometry signals measured with accelerometers located in bony flat areas of the tibia and the head, and (b) the dynamometric signals using a force platform mounted in the floor of the laboratory.

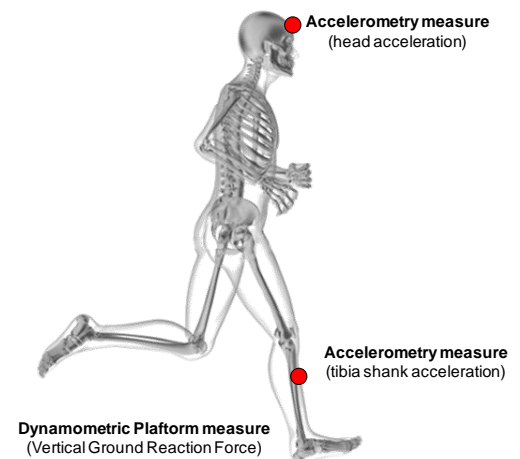


fig. 8: location of measuring sensors

This testing sessions were conducted at the movement analysis laboratory of IBV. The protocol for the session was as follows (fig. 9):

1. Warm up of the runner (10-15 minutes)
2. Biomechanical instrumentation of the runners (accelerometers in tibia and head) and calibration of the sensors.
3. Running series for the first condition tested until five valid measurements are achieved at the right speed (15-20 min)
4. Filling in of the questionnaire of perception for first condition tested.
5. Running series for the second condition tested until five valid measurements are achieved at the right speed (15-20 min)
6. Filling in of the questionnaire of perception for second condition tested.
7. Running series for the second condition tested until five valid measurements are achieved at the right speed (15-20 min)
8. Filling in of the questionnaire of perception for third condition tested.
9. Filling in the comparative questionnaire.



fig. 9: images of the in-lab session, from user instrumentation to running series

3.4 ANALYSIS OF DATA

3.4.1 Analysis of subjective perceptions

All questionnaires used can be found in Annexes.

Questions related to biomechanical properties were quantified in 5-point scale, comfort in a 7-point scale and preference in 3-point scale. Descriptive results of perception and preference answers of each property were analysed in order to identify differences in perception.

For the subjective questionnaires used in the short lab tests, these differences were contrasted in order to confirm if differences between the two shoes are statistically significant. To this end a numeric value was given to the scale levels. For the perception of properties, values ranged from +2 for 'totally agree' to -2 for 'totally disagree' using 0 for 'neither agree nor disagree'. For the rankings, +2 was assigned to the first, +1 to the second and +0 to the third. Mean scores for each question are compared by conducting a one-way analysis of variance (ANOVA) to evaluate any statistically significant differences ($\alpha=0,10$).

Moreover, a comparative analysis was performed for perception questions of the short lab test, in order to: (a) finding differences in perception between using any of the NOENE insoles and not using them, and (b) finding the differences in perception between using SOS1 and NO2 insoles. This analysis was used to magnify differences found by subjects between the two shoes.

3.4.2 Dynamometric Analysis

From the signals registered by the dynamometric platform, data related with the heel impact (fig. 10) was analysed, in particular the following parameters:

- **Magnitude of the impact**, measured as the value of the vertical force (N) at that instant weighed by the individual body weight of each runner (BW).
- **Instant of impact**, measured in seconds (sec) and in % of the step cycle.
- **Velocity of the impact** (slope), measured as the impact magnitude divided by the instant of impact.

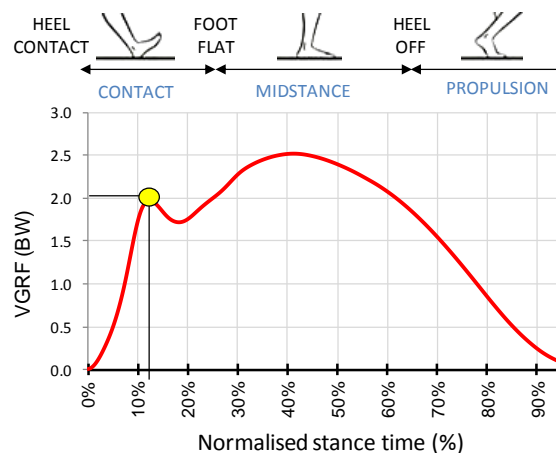


fig. 10: key parameters from dynamometric signal related to heel impacts during running

The measurements from 20 users were analysed. For each runner and for each condition compared (NO2, SOS1 and no insole), five repetitions were considered (in total 100 measurements per condition were analysed).

A repeated measures analysis of variance (RMANOVA) was conducted for each registered parameter (dependent variables) to evaluate any statistically significant differences ($\alpha=0,10$) between the conditions studied. Differences found between the shoes were then evaluated in terms of magnitude to confirm/discard differences in actual performance during running.

3.4.3 Magnitude Analysis of accelerometry measurements

From the signals registered by the accelerometers located in the tibia and head of the users, the following parameters were analysed (fig. 12):

- **Magnitude of the maximum impact in tibia**, measured in G.
- **Magnitude of the maximum impact in head**, measured in G.

Signals registered in the Lumbo-sacral region were experimental and finally were not used for the study due to the low reliability of the measurements.

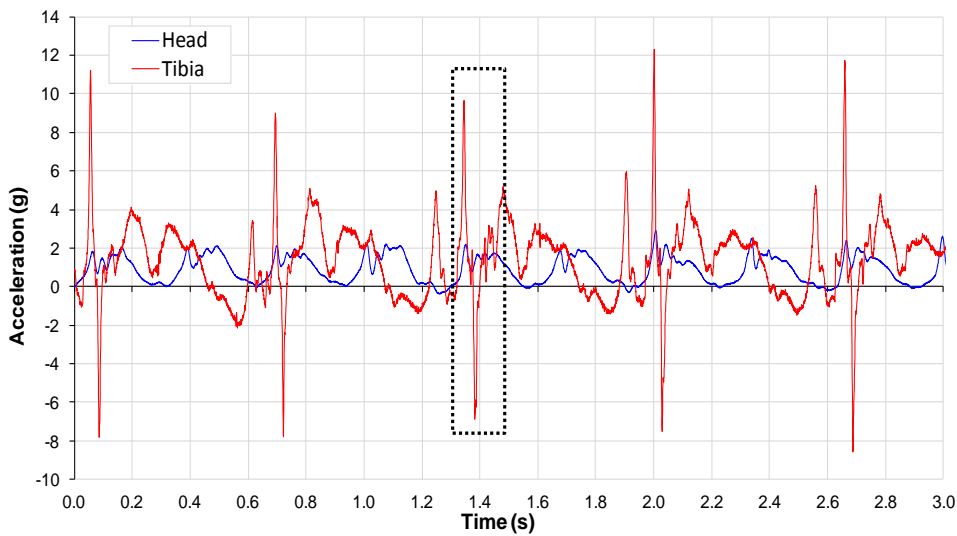


fig. 11: example of measurements from tibia (red) and head (blue)

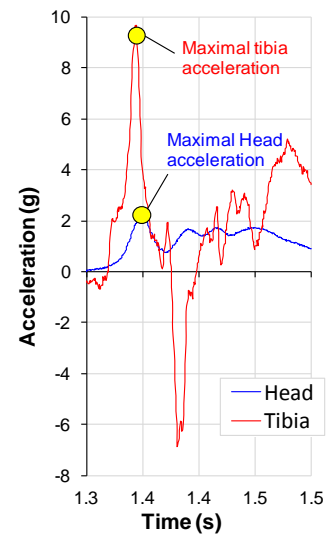


fig. 12: parameters analysed

The measurements from 21 users were analysed. For each runner and for each condition compared (NO2, SOS1 and no insole), six repetitions were considered (in total 378 measurements per condition were analysed).

A repeated measures analysis of variance (RMANOVA) was conducted for each registered parameter (dependent variables) to evaluate any statistically significant differences ($\alpha=0,10$) between the conditions studied. Differences found between the shoes were then evaluated in terms of magnitude to confirm/discard differences in actual performance during running.

3.4.4 Frequency Analysis of accelerometry measurements

The same signals analysed in magnitude, were treated in order to obtain their frequency information by means of the Fast Fourier Transform (FFT) obtaining its power spectral density (PSD) (fig. 13).

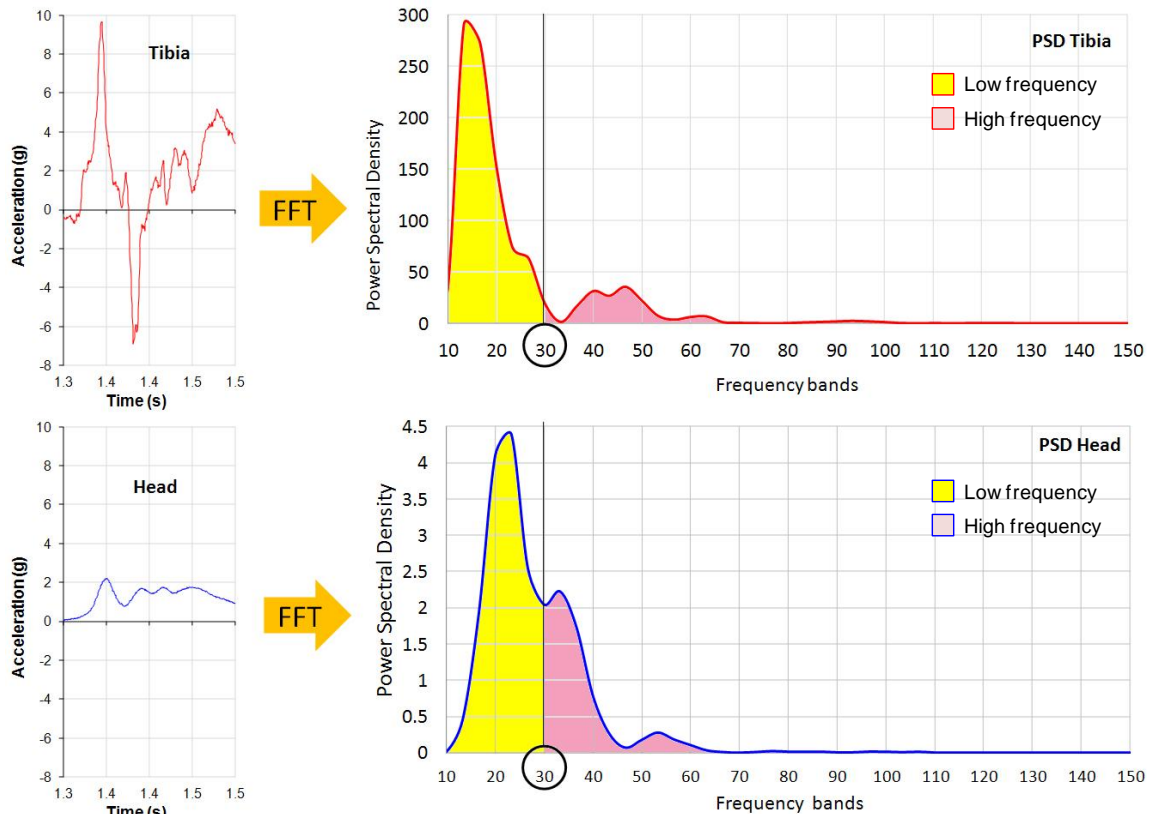


fig. 13: FFT and parameters of the PSD signals

From these processed signals, the following parameters were obtained (fig. 13):

- **Low frequency content in tibia:** area of the PSD signal between 10-30Hz.
- **High frequency content in tibia:** area of the PSD signal between 30-150Hz.
- **Low frequency content in head:** area of the PSD signal between 10-30Hz.
- **High frequency content in head:** area of the PSD signal between 30-150Hz.
- **Low frequency content absorbed by body** (from tibia to head): Difference between the low frequency PSD content registered in tibia and head (fig. 15).
- **High frequency content absorbed by body** (from tibia to head): Difference between the high frequency PSD content registered in tibia and head (fig. 15).

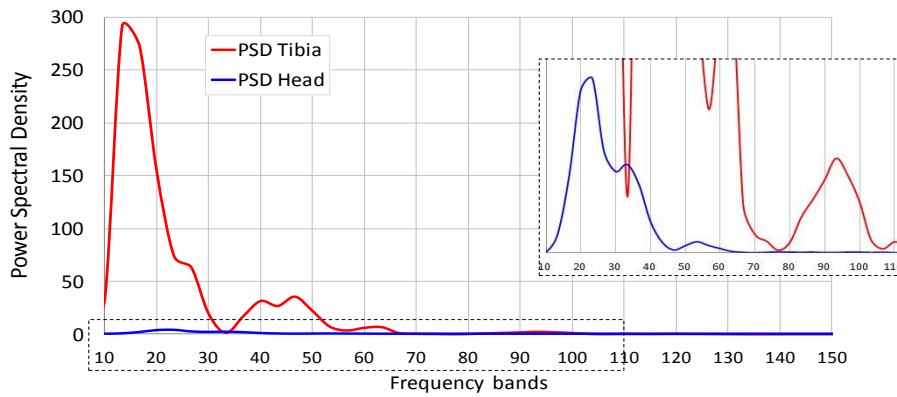


fig. 14: relation in magnitude between PSD in tibia and head

Frequencies between 0-10Hz correspond to voluntary movements. Beyond 10Hz are considered frequencies related to impacts at the heel strike contact. Frequencies between 10-30Hz are considered low frequencies and frequencies beyond 30Hz are considered high frequencies. There is no PDS content beyond 150 Hz in the signals analysed.

Human musculo-skeletal system (bones, joints, muscles, tendons, etc.) between the tibia and the head absorbs approximately 99% of the high frequencies (30-150Hz), and around 96% of the low frequency content (10-30Hz). Figures fig. 26 y fig. 27 show the relation between PSD signals in head and tibia. It can be observed that low frequencies are highly reduced (damped from 50-280 to 1-10) and that high frequencies practically disappear (damped to below 1)

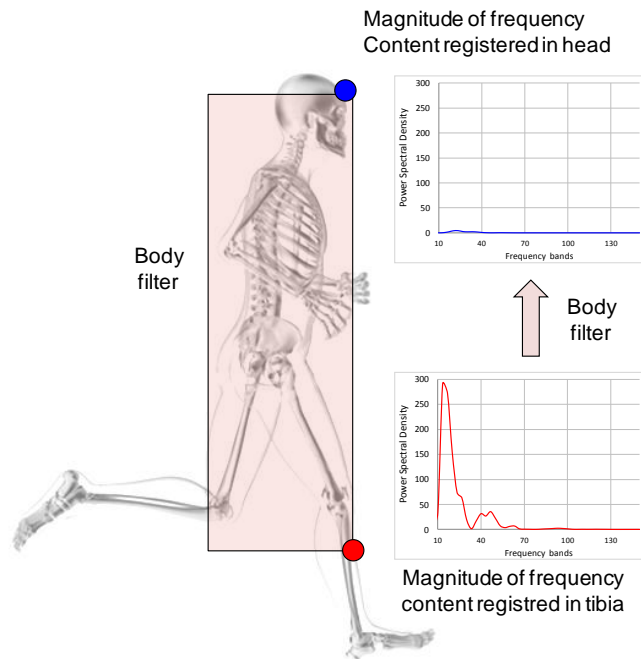


fig. 15: Illustration of the body filter of vibrations along the musculo-skeletal system

4. RESULTS

Results have been structured in two sections: subjective assessments (including subjective perception results from short and long testing sessions) and objective assessments (including biomechanical measurements).

4.1 SUBJECTIVE ASSESSMENT

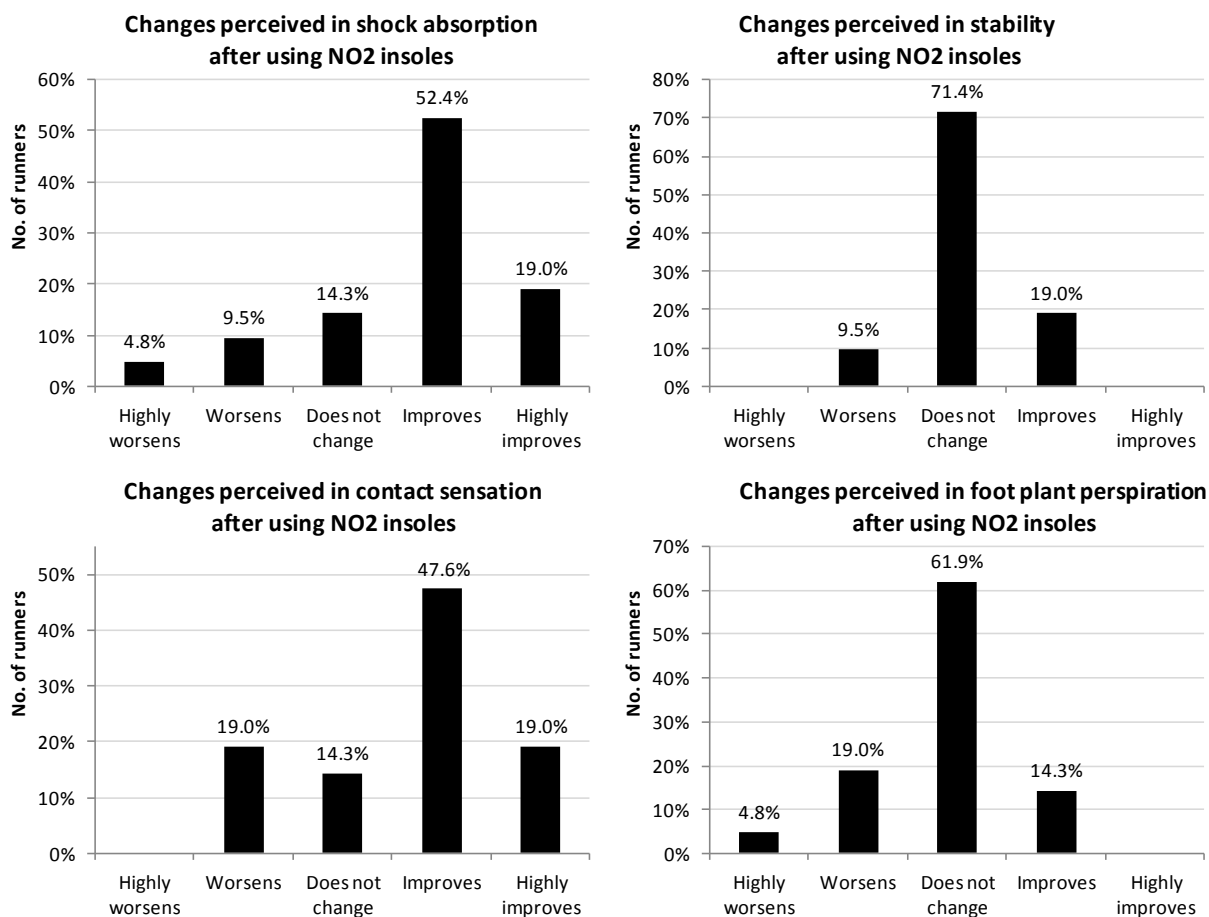
4.1.1 Short 'in-lab' tests

The 21 participating runners performed, on average, 5.4 training sessions using the NO2 insoles in their own footwear, covering an average distance of 57.7 Km in 5.3 hours (Table 2).

Table 2: Average testing parameters

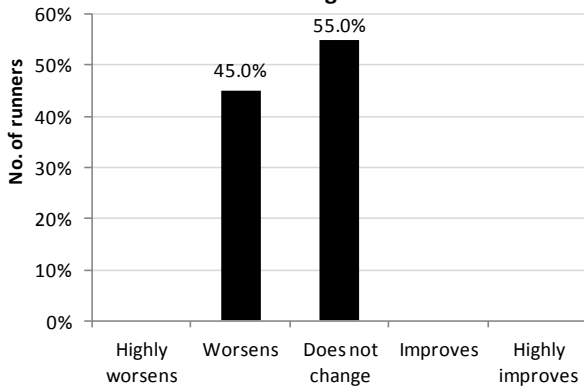
	Average (Std. Dev.)
Total Km of test	57.7 (28.3)
no. of test sessions	5.4 (2.2)
Total no. of test hours	5.3 (3.5)

The following graphs show the frequencies of the answers of the runners about the changes perceived in their shoes after introducing the NO2 insoles for each of the biomechanical properties enquired:

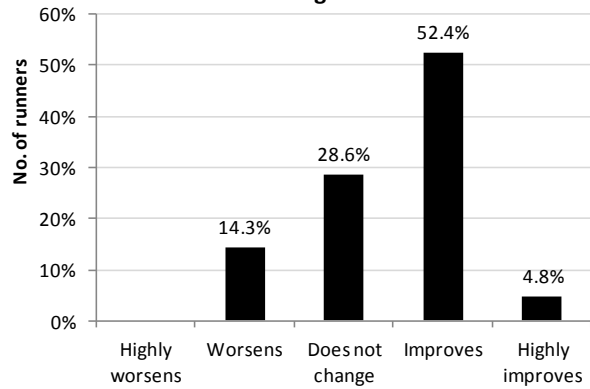


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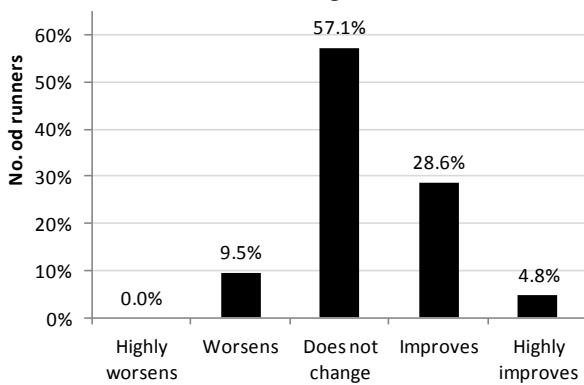
Changes perceived in footplant temperature after using NO2 insoles



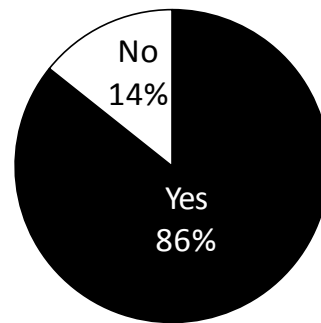
Changes perceived in footwear comfort after using NO2 insoles



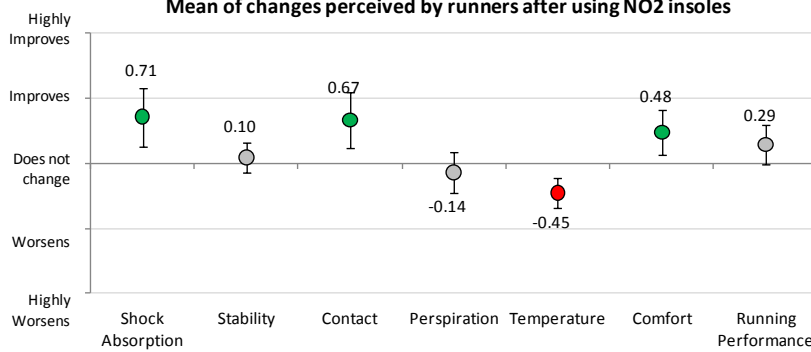
Changes perceived in running performance after using NO2 insoles



¿Did the user keep the insoles after the trial period?



Mean of changes perceived by runners after using NO2 insoles



	Media	IC95
Absorption	0.71	0.45
Stability	0.10	0.23
Contact	0.67	0.43
Perspiration	-0.14	0.31
Temperature	-0.45	0.22
Comfort	0.48	0.35
Performance	0.29	0.31

The main results from this test were that after using the NO2 insoles:

- **73% of runners reports perceiving an improvement of shock absorption of footwear.**
- 67% of runners reports perceiving an improvement in ground contact perception.
- 24% of runners reports perceiving a worsening of foot plant perspiration while 62% do not report any change for this property.
- 45% of runners report perceiving an increase in foot plant while 55% do not report any change for this property.
- **57% of runners reports perceiving an improvement of footwear comfort.**
- 33% of runners reports perceiving a worsening of foot plant perspiration while 57% do not report any change for this property.
- **71% of runners reported not perceiving any change in footwear stability.**
- **86% of runners decided to keep the insoles after the tests.** 2 of these 18 runners preferred to keep the SOS1 insoles instead of the NO2 ones.

4.1.2 Short 'in-lab' tests

Descriptive results

Frequencies of the runners' answers in relation to any trouble found with footwear fitting are shown in fig. 16.

As it can be observed, no differences were found between the three conditions tested. In general users reported that by adjusting shoe lacing they were able to find a correct fit for the shoes.

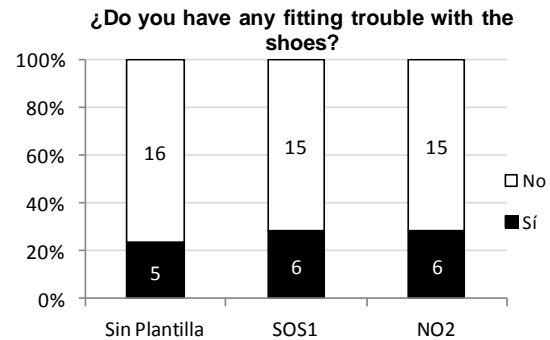


fig. 16: Answers to the question '¿do you have any problems wearing the footwear?'

The following graphs (fig. 17) show the average (and the 95% confidence interval) scores obtained by each condition for the three biomechanical properties enquired separately (just after each tested condition).

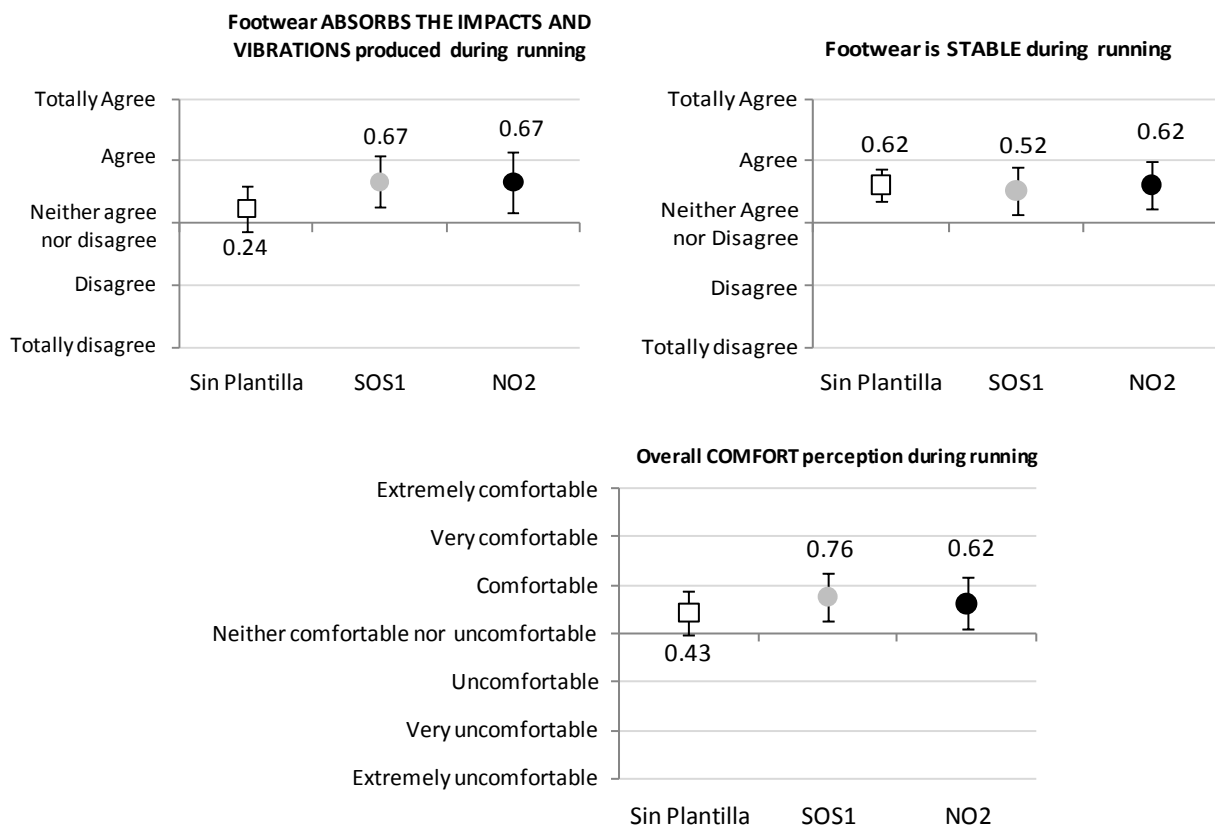


fig. 17: Average and IC95 for shock absorption, comfort and stability of the three conditions (direct assessment)

The following graphs show the average and the 95% confidence interval (fig. 18) and the cumulated scores (fig. 19) obtained by each condition for the three biomechanical properties enquired comparatively (based on ranks established after all the tests in the three conditions were concluded).

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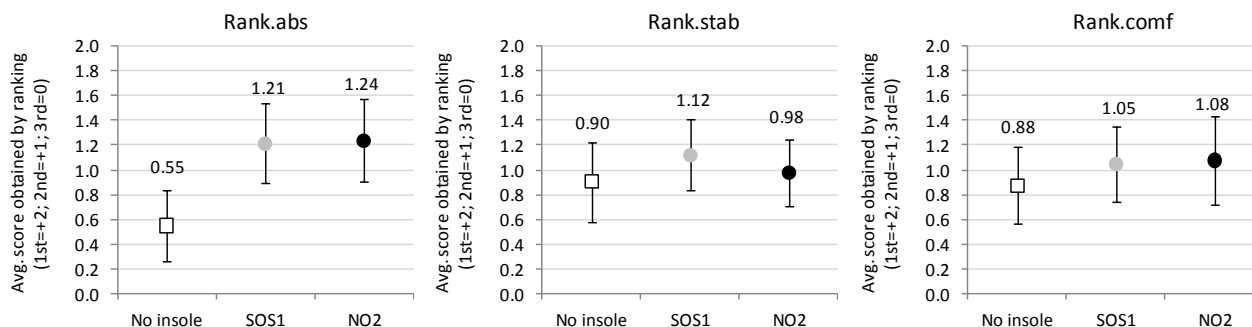
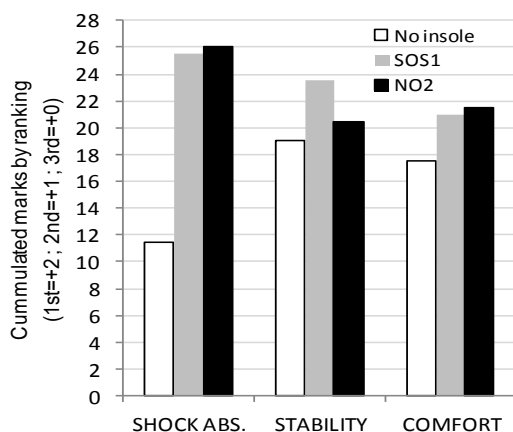


fig. 18: Average and IC95 for shock absorption, comfort and stability of the three conditions (comparative assessment extracted from rankings)



Property	No insole	SOS1	NO2
Shock abs.	11.50	25.5	26
Stability	19.00	23.5	20.5
Comfort	17.50	21	21.5

fig. 19: Average and IC95 for shock absorption, comfort and stability of the three conditions

Results of the statistical analysis

The results from the statistical analysis (ANOVA) of results are summarised in Table 3.

Table 3: Analysis of variance of subjective answers to short in-la tests

	No insole		SOS1		NO2		Anova P
	Mean	IC95	Mean	IC95	Mean	IC95	
Shock abs.	0.24	0.36	0.62	0.25	0.43	0.44	0.19
Stability	0.67	0.41	0.52	0.37	0.76	0.49	0.82
Comfort	0.67	0.47	0.62	0.37	0.62	0.53	0.44
Rank.abs	0.55	0.286	1.21	0.32	1.24	0.336	<0.001 ***
Rank.stab	0.90	0.322	1.12	0.29	0.98	0.274	0.59
Rank.conf	0.88	0.309	1.05	0.30	1.08	0.356	0.68

The main results that can be drawn from this analysis are:

- **The use of both SOS1 and NO2 insole significantly improve ($p < 0.001$) the perception of shock absorption in running.**
- **There are no significant differences between the perceptions of shock absorption between the insole samples tested (NO2 and SOS1).**
- Despite average values show a trend in favour of the improvement of comfort and stability by SOS1 and NO2 insoles, no statistically significant differences were found between the three conditions tested.

Results of the comparative study

Descriptive results of comparing wearing any of the NOENE insoles versus not wearing any additional insole are shown in Table 4 and fig. 20

Table 4: comparative study WITH vs. WITOUT NOENE

	no. of users			% of users		
	Shock abs.	Stability	Comfort	Shock abs.	Stability	Comfort
better WITH NOENE	18	6	11	86%	29%	52%
no differences	1	12	7	5%	57%	33%
better WITOUT NOENE	2	3	3	10%	14%	14%

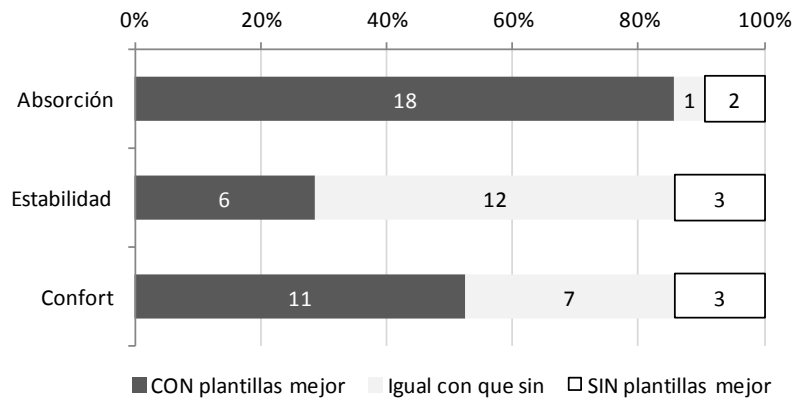


fig. 20: comparative study WITH vs. WITOUT NOENE

Descriptive results of comparing wearing SOS1 insoles versus wearing NO2 insoles are shown in Table 5 and fig. 21

Table 5: comparative study SOS1 vs. NO2

	no. of users			% of users		
	Stability	Comfort	Stability	Comfort	Stability	Comfort
SOS1 better than NO2	9	4	7	43%	19%	33%
SOS1 equal to NO2	5	11	9	24%	52%	43%
NO2 better than SOS1	7	6	5	33%	29%	24%

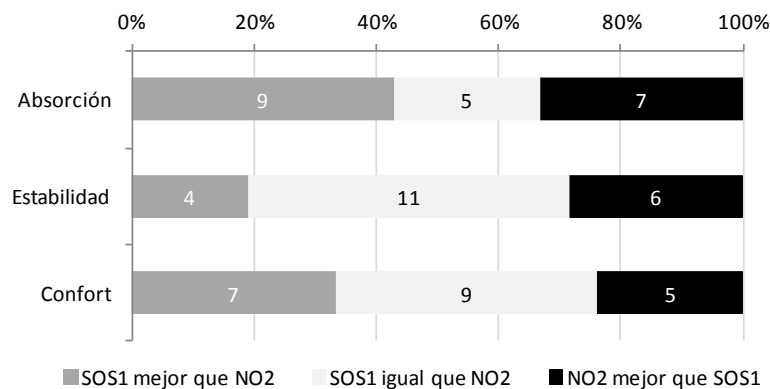


fig. 21: comparative study SOS1 vs. NO2

The main findings resulting from this analysis were that:

- **86% of runners reported an improvement of shock absorption when using one of the NOENE insoles.**
- 52% of runners perceive an improvement in footwear comfort when using one of the NOENE insoles.
- 57% of runners do not perceive any difference between using or not any of the NOENE insoles.

4.2 OBJECTIVE ASSESSMENT

4.2.1 Assessment of vertical reaction forces

Descriptive and RMANOVA results of the different variables considered are shown in [fig. 22](#) and [Table 6](#).

Table 6: Mean, confidence interval 95% and ANOVA results for the 3 conditions

		No insole		SOS1		NO2		ANOVA
		Mean	IC95	Mean	IC95	Mean	IC95	P
Peak	Heel Impact Peak (N)	1267.7	54.9	1275.4	51.7	1278.9	55.6	0.88
	Heel Impact Peak (BW)	1.79	0.05	1.81	0.05	1.81	0.06	0.84
Slope	Heel Impact Slope (N/s)	35171	1703	35856	1589	35679	1754	0.65
	Heel Impact Slope (BW/s)	50.11	2.06	51.19	1.95	50.98	2.24	0.57
Time	Time to peak (s)	0.037	0.001	0.036	0.001	0.036	0.001	0.54
	Time to peak (% of contact time)	15.0	0.5	14.8	0.4	15.0	0.5	0.53

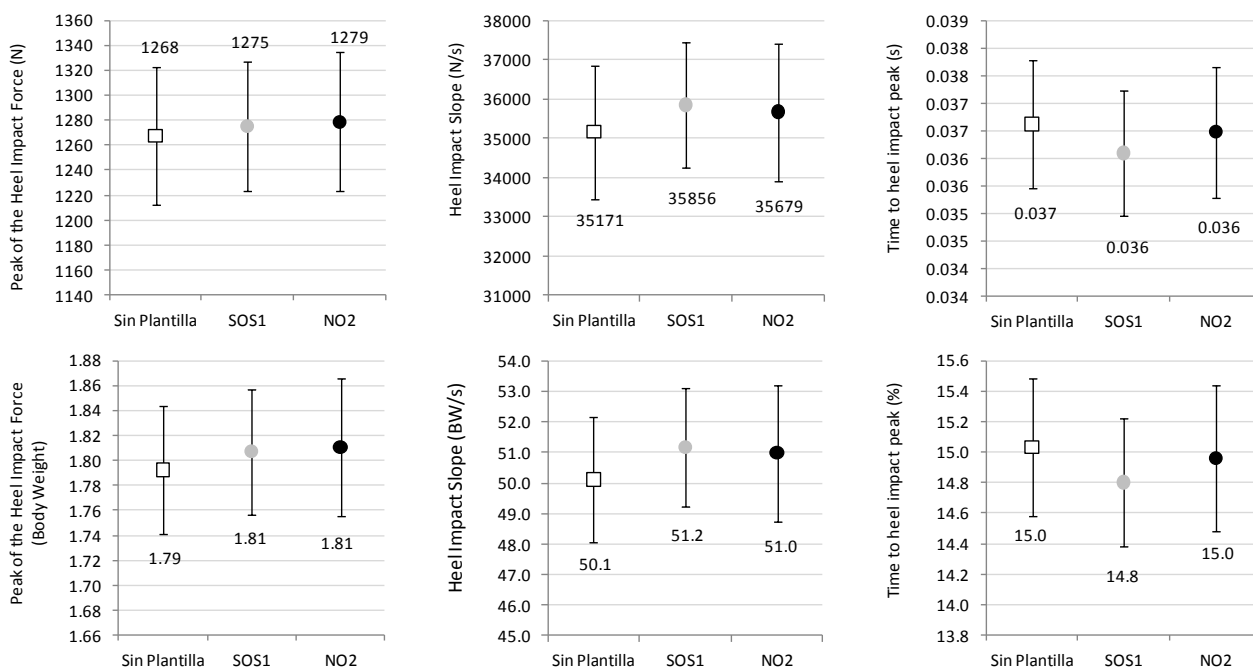


fig. 22: Mean and confidence intervals 95% for the parameters considered for the 3 conditions

As it can be observed, **no significant differences were found between the three conditions studied regarding vertical forces at the heel impact.**

4.2.2 Assessment of tibia and head accelerations in magnitude

Figures fig. 23 and fig. 24 show respectively a representation of the acceleration signals in tibia and head for each of the studied conditions.

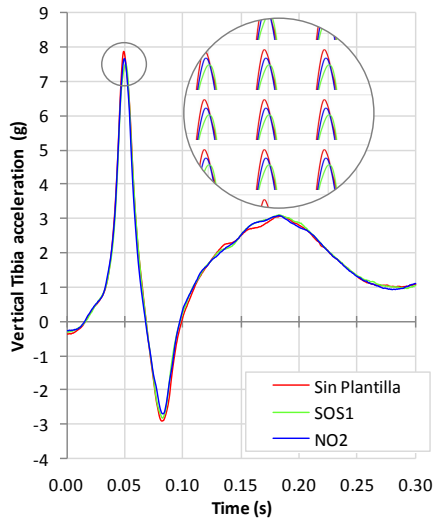


fig. 23: a representation of the acceleration signals in tibia for the three conditions

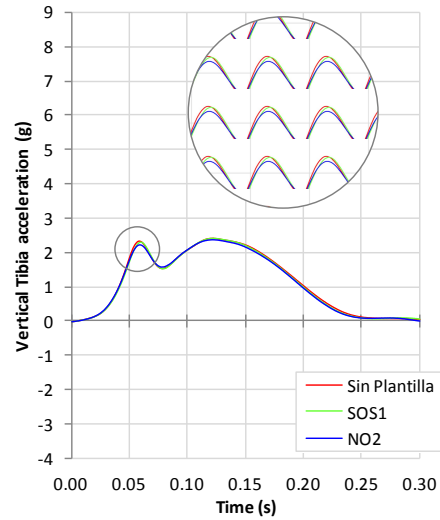


fig. 24: a representation of the acceleration signals in head for the three conditions

Table 7 and fig. 25 show the mean, confidence interval 95% and the results of the repeated measures analysis of variance (RMANOVA) for the three conditions studied.

Table 7: Mean, confidence intervals and RMANOVA results for the three conditions studied

	No insole		SOS1		NO2		ANOVA	Post hoc test		
	Mean	IC95	Mean	IC95	Mean	IC95		P	SOS1=Sin	NO2=Sin
Maximal tibia acceleration	13.7	0.9	12.9	0.8	13.1	0.8	0.001	0.002	0.018	1.000
Maximal head acceleration	3.1	0.1	3.1	0.1	3.0	0.1	0.027	0.352	0.795	0.022

ANOVA test colour code: p>0.1 p<0.1 p<0.05 p<0.01

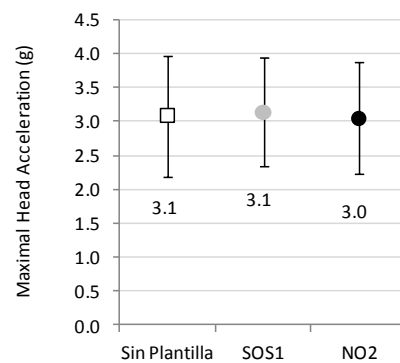
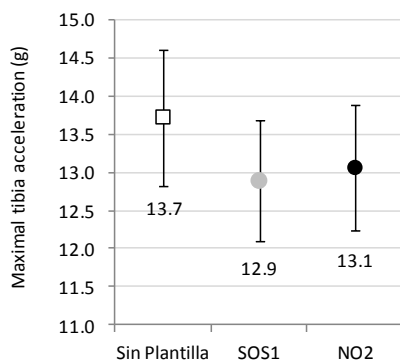


fig. 25: Mean and confidence intervals results for the three conditions studied

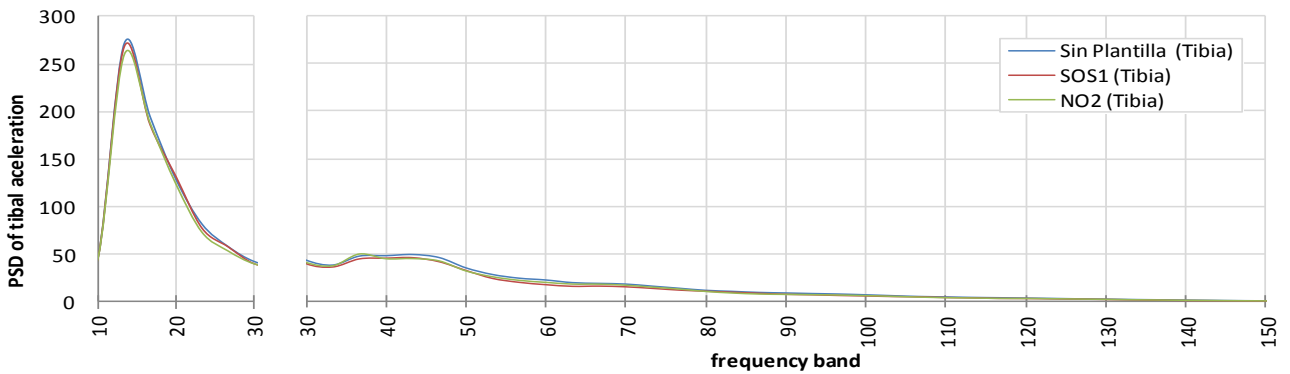
The main findings from this analysis were that:

- **Maximal tibia acceleration is significantly ($p<0.05$) reduced by the use of the two NOENE insoles.** The average reduction provided by SOS1 and NO2 is respectively of 0.8G and 0.6G, which corresponds to a relative reduction of approximately 6% and 5% compared to not using additional insoles.

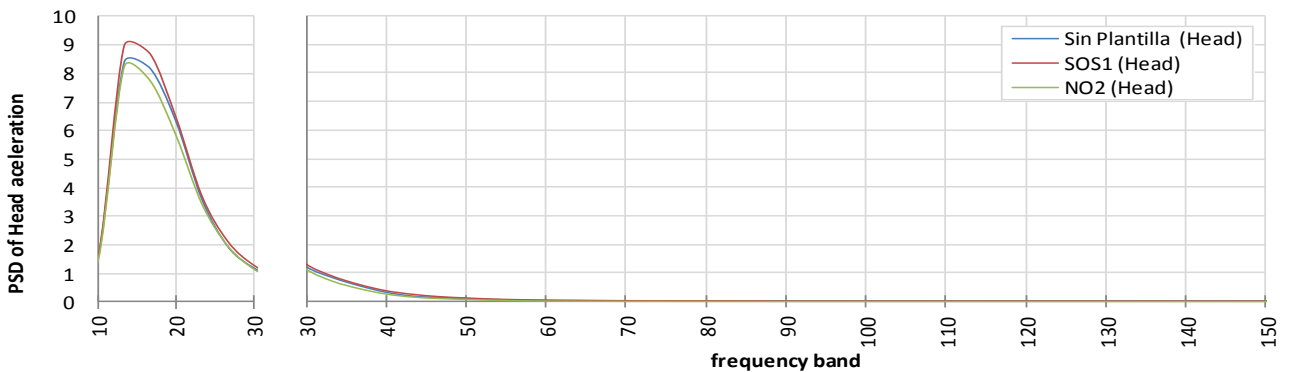
- There are statistically significant differences ($p < 0.05$) in head accelerations between using SOS1 and NO2 insoles, however in magnitude this difference is of about 0.1G which is negligible.

4.2.3 Assessment of tibia and head accelerations in frequency

Figures [fig. 26](#) and [fig. 27](#) show the average PSD signals for the 3 conditions studied in tibia and head during heel strike.

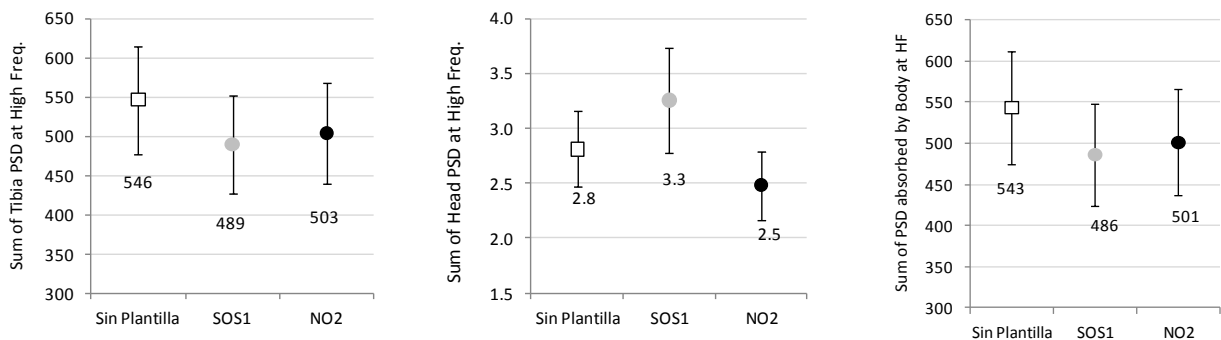


[fig. 26](#): average PSD signals for the 3 conditions studied in tibia during heel strike



[fig. 27](#): average PSD signals for the 3 conditions studied in head during heel strike

[Table 8](#) and [fig. 28](#) show the results obtained for each of the conditions studied and for each of the parameters analysed regarding frequency analysis of tibia and head accelerations.



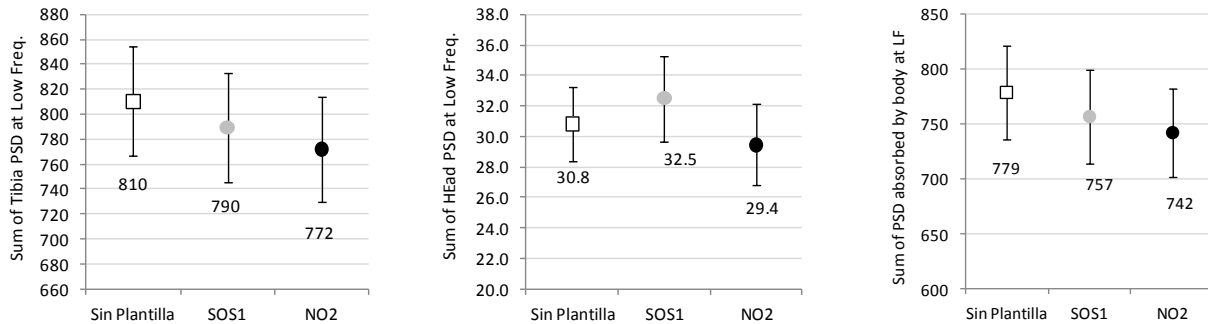


fig. 28: Mean and confidence intervals of the key parameters of frequency analysis

Table 8: Mean, confidence intervals and RMANOVA results for the three conditions studied

		No insole		SOS1		NO2		ANOVA	Post hoc test		
		Mean	IC95	Mean	IC95	Mean	IC95		P	SOS1=Sin	NO2=Sin
Tibia	High frequency content	546	69	489	62	503	65	0.011	0.012	0.092	1.000
	Low frequency content	810	44	790	44	772	42	0.066	0.632	0.059	0.840
Head	High frequency content	2.81	0.35	3.26	0.48	2.48	0.31	0.003	0.159	0.459	0.002
	Low frequency content	30.82	2.41	32.49	2.79	29.44	2.67	0.069	0.622	0.885	0.063
Body	High Freq. absorbed	543	69	486	62	501	64	0.010	0.011	0.094	1.000
	Low freq. absorbed	779.4	42.6	757.2	42.5	742.4	40.7	0.063	0.481	0.059	1.000

ANOVA test colour code: p>0.1 p<0.1 p<0.05 p<0.01

The main findings of these analyses were:

- SOS1 and NO2 insoles provide a statistically significant reduction ($p < 0.05$ and $p < 0.1$ respectively) of the **high frequency** content (30-150Hz) of the PSD of the heel strike impacts during running. The estimated average reduction that each of them provides is of 11% (SOS1) and 8% (NO2) compared to not using any insole.
- There are no statistically significant differences between the two insoles with regard to the reduction of high frequency content of the PSD.
- NO2 insoles provide a statistically significant reduction ($p < 0.01$) of the **low frequency** content (10-30Hz) of the PSD of the heel strike impacts during running. The estimated average reduction that each of them provides is of 5% compared to not using any insole.

5. CONCLUSIONS

The results of the study demonstrate that using NOENE[®] material in footwear insoles contributes to the improvement of certain biomechanical properties of running footwear, in particular to shock absorption. A good indicator of this fact is that 18 out of the 21 users decided to keep the insoles to use them in their daily running sessions.

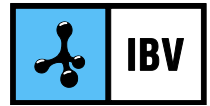
The most important conclusions related **shock absorption capacity** provided by NOENE[®] insoles that can be drawn from this study are:

- In blind tests conducted with a reference footwear in short run series, 86% of participants reported an improvement of shock absorption when using any of the NOENE[®] insoles (NO2, SOS1).
- After two weeks using the NO2 insoles in their training sessions with their own shoes (usually premium running shoes), 73% of runners reported that the insoles improved the shock absorption capacity of their footwear
- NOENE[®] insoles used under the original insole of the running shoes tested achieved an average reduction of the tibia impact between 0.6-0.8G, which is a ~5-6% reduction, compared to not using them. To have a better idea of the magnitude of this reduction, a premium running shoe¹ recently evaluated at IBV under the same test conditions provided a reduction of 1.8G (~13%) compared to the generic shoe used in this test. This means that the 0.6-0.8G reduction achieved by NOENE insoles represents 33-44% of the shock absorption effectiveness that a premium running shoe provides.
- NOENE[®] insoles used under the original insole of the running shoes tested achieved an average cancelled 11% (SOS1) and 8% (NO2) of the high frequency content (beyond 30Hz) derived from the heel impacts during running. These frequencies can be considered the most harmful because they are absorbed passive damping elements of the body (knee, hip and backbone joints).
- NOENE[®] insoles did not reduce nor increase the vertical ground reaction forces at the heel impact during running.
- No clear differences in shock absorption performance were found between the types of NOENE[®] insoles (SOS1 and NO2), neither in subjective assessments nor in objective laboratory measurements.

Other relevant conclusions from this study related to **other properties** of footwear are:

- NOENE[®] insoles did not affect perceived footwear stability, foot plant perspiration or overall running performance.
- 45% of runners reported perceiving an increase in foot plant temperature when using the NO2 insole for long training sessions; however this fact was not perceived as very important by most of users.
- Half of the runners participating in the study reported an improvement in the perceived comfort when using any of the NOENE[®] insoles both at short laboratory sessions and at long outdoor training sessions.

¹ It was the shoe that achieved the "best running shoe of 2011" award by the magazine "Runner's World"



6. ANNEXES

ENSAYO DE PLANTILLAS PARA ATENUACIÓN DE VIBRACIONES EN CALZADO

Abril 2012 -Junio 2012

Este cuestionario es de carácter estrictamente CONFIDENCIAL. Sus datos únicamente se utilizarán como parte de un análisis estadístico con una muestra de población amplia, en ningún caso se hará referencia a los datos de un cuestionario aislado.

CODSUJ:		FECHA:	
Nº muestra NO2 para casa			
NOMBRE:			
ALTURA:		PESO:	
		EDAD:	

Salidas/ Semana:		Km / Semana:	
Talla habitual en calzado carrera:			

CALZADO ACTUAL Y PLANTILLA			
MARCA Y MODELO:			
TALLA:		Tiempo que lo tiene:	
Comentarios sobre la plantilla o el calzado¹:			

TOMAR FOTO DEL CALZADO y DE LA PLANTILLA

EXPLORACIÓN CLINICA BÁSICA

--

VALORACION DE SU CALZADO

P1.- ¿Tiene alguna molestia?

--

P2.- ¿Cómo le parece la **ABSORCIÓN DE IMPACTOS** de su calzado?

Absorción MUY ALTA <input type="checkbox"/>	Absorción ALTA <input type="checkbox"/>	Ni alta ni baja <input type="checkbox"/>	Absorción BAJA <input type="checkbox"/>	Absorción MUY BAJA <input type="checkbox"/>
--	--	---	--	--

¹ Por ejemplo: plantilla desgastada, con anatomía, plana, se la ha cambiado, etc..

P3.- ¿Cómo preferiría la **ABSORCIÓN DE IMPACTOS** de su calzado?

Más absorción <input type="checkbox"/>	Igual <input type="checkbox"/>	Menos absorción <input type="checkbox"/>
---	-----------------------------------	---

P4.- ¿Qué opina sobre la **ESTABILIDAD MEDIO-LATERAL** del calzado?

Estable <input type="checkbox"/>	Algo Estable <input type="checkbox"/>	Neutral <input type="checkbox"/>	Algo Inestable <input type="checkbox"/>	Inestable <input type="checkbox"/>
-------------------------------------	--	-------------------------------------	--	---------------------------------------

P5.- ¿Qué opina sobre el **MATERIAL DE LA SUELA** de su calzado en.....?

	Muy blando	Algo blando	Ni blando ni duro	Algo duro	Muy duro
TALÓN	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PARTE DELANTERA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

P6.- ¿Cómo preferiría el **MATERIAL DE LA SUELA** de su calzado en...?

	Más blando	Igual	Más duro
TALON	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PARTE DELANTERA	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

P7.- ¿Qué opina sobre LA **TRANSPIRACIÓN** DE SU PLANTILLA?

Muy transpirable <input type="checkbox"/>	Algo transpirable <input type="checkbox"/>	Neutral <input type="checkbox"/>	Poco transpirable <input type="checkbox"/>	Muy poco transpirable <input type="checkbox"/>
--	---	-------------------------------------	---	---

P8.- ¿Cómo valora el **CONFORT** de su calzado?

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	ni cómodas ni incómodas <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
--	---	-------------------------------------	---	---------------------------------------	---	--

VALORACION DE SU CALZADO CON PLANTILLA NO2

El experto IBV introduce las plantillas en el calzado del usuario. Se lo prueba.

P9.- ¿Siente alguna molestia o problema de ajuste?

El experto IBV entrega el protocolo de ensayos en casa.

COMENTARIOS:

ENSAYO DE PLANTILLAS EN CALZADO DE CARRERA

Su participación en este ensayo está sujeta al cumplimiento del siguiente protocolo.

1. ACUDIR AL IBV PARA RECOGIDA DE LAS PLANTILLAS Y CUMPLIMENTAR ENCUESTA INICIAL CON UN EXPERTO IBV

Debe acudir cuando se le cite y traer el calzado deportivo que va a emplear durante la prueba del producto. Este calzado debe haber sido utilizado de forma habitual durante al menos un mes.

Una vez comprobada la adecuación del calzado, se le pasará una encuesta general para evaluar el calzado y su actividad deportiva habitual.

Un experto del IBV colocará las plantillas en el calzado. El usuario no deberá extraer las plantillas, debiendo permanecer en el calzado hasta la segunda visita al IBV para la evaluación de uso del producto. Se le citará tras un periodo mínimo que permita al usuario utilizar las plantillas en al menos 4 entrenamientos.

2. EMPLEO DE LAS PLANTILLAS EN SUS ENTRENAMIENTOS

Durante el tiempo transcurrido hasta la cita, el usuario deberá realizar sus sesiones de entrenamiento habituales empleando el calzado evaluado en el punto 1 con las plantillas a evaluar.

El usuario deberá completar al menos CUATRO SESIONES DE ENTRENAMIENTO de duración no inferior a 45 minutos utilizando las plantillas.

El usuario deberá anotar las fechas de las salidas y su duración o kilómetros aproximados. En caso de molestias deberá contactar con el ibv antes de retirar las plantillas de su calzado.

3. ENCUESTA DE USO DE LAS PLANTILLAS EN EL IBV

Transcurrido el periodo estipulado hasta la segunda cita, el usuario acudirá al IBV **con el calzado empleado** para cumplimentar un cuestionario de percepción para valorar las posibles mejoras proporcionadas por las plantillas.

Un experto del IBV procederá a la extracción de las plantillas tras la evaluación.

ENSAYO DE PLANTILLAS PARA ATENUACIÓN DE VIBRACIONES EN CALZADO

Abril 2012 -Junio 2012

Este cuestionario es de carácter estrictamente CONFIDENCIAL. Sus datos únicamente se utilizarán como parte de un análisis estadístico con una muestra de población amplia, en ningún caso se hará referencia a los datos de un cuestionario aislado.

CODSUJ:	FECHA:
NOMBRE:	

Detalle el uso del calzado (DEBEN RELLENARSE AL MENOS 4 SESIONES)	
Día de la salida:	Km y/o duración del entrenamiento:
Día de la salida:	Km y/o duración del entrenamiento:
Día de la salida:	Km y/o duración del entrenamiento:
Día de la salida:	Km y/o duración del entrenamiento:
Día de la salida:	Km y/o duración del entrenamiento:
Día de la salida:	Km y/o duración del entrenamiento:

VALORACION DE SU CALZADO CON PLANTILLAS NO2

P1.- ¿Siente alguna molestia con el uso de las plantillas?

--

P2.- ¿Ha sentido algún problema de ajuste de zapatilla al llevar la plantilla?

SI NO

En caso afirmativo, describa la zona o el problema:

--

P3.- En cuanto a molestias anteriores en la espalda, tendones o articulaciones, he percibido...

Mucha mejora <input type="checkbox"/>	Ligera mejora <input type="checkbox"/>	Ninguna mejora <input type="checkbox"/>	No tenía molestias previas <input type="checkbox"/>
--	---	--	--

En caso afirmativo, describa la zona:

--

P4.- ¿Cómo le parece la ABSORCIÓN DE IMPACTOS del calzado con las plantillas?

Absorción MUY ALTA <input type="checkbox"/>	Absorción ALTA <input type="checkbox"/>	Ni alta ni baja <input type="checkbox"/>	Absorción BAJA <input type="checkbox"/>	Absorción MUY BAJA <input type="checkbox"/>
--	--	---	--	--

P5.- ¿Cree que la ABSORCIÓN DE IMPACTOS ha cambiado respecto a no llevar plantillas?

Ha mejorado mucho <input type="checkbox"/>	Ha mejorado algo <input type="checkbox"/>	Es la misma <input type="checkbox"/>	Ha empeorado algo <input type="checkbox"/>	Ha empeorado mucho <input type="checkbox"/>
---	--	---	---	--

P6.- ¿Qué opina sobre la ESTABILIDAD MEDIO-LATERAL del calzado con las plantillas?

Estable <input type="checkbox"/>	Algo Estable <input type="checkbox"/>	Neutral <input type="checkbox"/>	Algo Inestable <input type="checkbox"/>	Inestable <input type="checkbox"/>
-------------------------------------	--	-------------------------------------	--	---------------------------------------

P7.- ¿Cree que la ESTABILIDAD MEDIO-LATERAL ha cambiado respecto a no llevar plantillas...?

Ha mejorado mucho <input type="checkbox"/>	Ha mejorado algo <input type="checkbox"/>	Es la misma <input type="checkbox"/>	Ha empeorado algo <input type="checkbox"/>	Ha empeorado mucho <input type="checkbox"/>
---	--	---	---	--

P8.- ¿Cree que ha cambiado su SENSACIÓN DE CONTACTO con el suelo respecto a no llevar plantillas ...?

Ha mejorado mucho <input type="checkbox"/>	Ha mejorado algo <input type="checkbox"/>	Es la misma <input type="checkbox"/>	Ha empeorado algo <input type="checkbox"/>	Ha empeorado mucho <input type="checkbox"/>
---	--	---	---	--

En caso afirmativo o negativo, describa el porqué:

P9.- ¿Cree que ha cambiado la TRANSPIRABILIDAD en la planta con respecto a no llevar plantillas...?

Ha mejorado mucho <input type="checkbox"/>	Ha mejorado algo <input type="checkbox"/>	Es la misma <input type="checkbox"/>	Ha empeorado algo <input type="checkbox"/>	Ha empeorado mucho <input type="checkbox"/>
---	--	---	---	--

En caso afirmativo o negativo, describa el porqué:

P10.- ¿Cómo valora el CONFORT de sus deportivas con las plantillas?

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	Normales (ni cómodas ni incómodas) <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
--	---	-------------------------------------	--	---------------------------------------	---	--

P11.- ¿Cree que el CONFORT ha cambiado respecto a no llevar plantillas...?

Ha mejorado mucho <input type="checkbox"/>	Ha mejorado algo <input type="checkbox"/>	Es la misma <input type="checkbox"/>	Ha empeorado algo <input type="checkbox"/>	Ha empeorado mucho <input type="checkbox"/>
---	--	---	---	--

P12.- ¿Cree que el uso de estas plantillas influye en su rendimiento durante la carrera?

Influye bastante positivamente <input type="checkbox"/>	Influye positivamente <input type="checkbox"/>	No influye <input type="checkbox"/>	Influye negativamente <input type="checkbox"/>	Influye bastante negativamente <input type="checkbox"/>
--	---	--	---	--

P13.- ¿Tiene algún otro comentario que hacer acerca del efecto de las plantillas que ha llevado?

P14.- Observaciones del experto

ENSAYO DE PLANTILLAS PARA ATENUACIÓN DE VIBRACIONES EN CALZADO

Abril 2012 -Junio 2012

Este cuestionario es de carácter estrictamente CONFIDENCIAL. Sus datos únicamente se utilizarán como parte de un análisis estadístico con una muestra de población amplia, en ningún caso se hará referencia a los datos de un cuestionario aislado.

CODSUJ:	FECHA:
NOMBRE:	

ORDEN ENSAYOS	Primero []	Segundo []	Tercero []
----------------------	-----------------	-----------------	-----------------

C1 VALORACION DE ZAPATILLA DE REFERENCIA

P1/ NÚMERO DE MUESTRA CALZADO EMPLEADA _____

P2/ ¿Tiene alguna molestia o problema de ajuste?

P3/ El calzado ABSORBE LOS IMPACTOS Y VIBRACIONES que se producen durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
---	--	---	---	--

P4/ El calzado ES ESTABLE durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
---	--	---	---	--

P5/ Valoración global del CONFORT del calzado

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	Ni cómoda ni incómoda <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
--	---	-------------------------------------	---	---------------------------------------	---	--

C2 VALORACION CON PLANTILLA SOS1

P1/ NÚMERO DE MUESTRA PLANTILLA SOS1 EMPLEADA _____

P2/ ¿Tiene alguna molestia o problema de ajuste?

P3/ El calzado ABSORBE LOS IMPACTOS Y VIBRACIONES que se producen durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
---	--	---	---	--

P4/ El calzado ES ESTABLE durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
---	--	---	---	--

P5/ Valoración global del CONFORT del calzado

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	Ni cómoda ni incómoda <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
--	---	-------------------------------------	---	---------------------------------------	---	--

C3 VALORACION CON PLANTILLA NO2

P1/ NÚMERO DE MUESTRA PLANTILLA NO2 EMPLEADA _____

P2/ ¿Tiene alguna molestia o problema de ajuste?

P3/ El calzado **ABSORBE LOS IMPACTOS Y VIBRACIONES** que se producen durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
---	--	---	---	--

P4/ El calzado **ES ESTABLE** durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
---	--	---	---	--

P5/ Valoración global del **CONFORT** del calzado

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	Ni cómoda ni incómoda <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
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COMPARACIÓN

Ordene las tres condiciones en relación a los aspectos enumerados a continuación, puntuando:

- 1 para la que más
- 3 para la que menos

Si no nota diferencia se dará el mismo número de orden.

1/ **PABSORCIÓN DE IMPACTOS Y VIBRACIONES** durante la carrera:

DEPORTIVA SIN PLANTILLA

DEPORTIVA CON PLANTILLA SOS1

DEPORTIVA CON PLANTILLA NO2

2/ **ESTABILIDAD** durante la carrera:

DEPORTIVA SIN PLANTILLA

DEPORTIVA CON PLANTILLA SOS1

DEPORTIVA CON PLANTILLA NO2

3/ **CONFORT** general:

DEPORTIVA SIN PLANTILLA

DEPORTIVA CON PLANTILLA SOS1

DEPORTIVA CON PLANTILLA NO2

COMENTARIOS:

ORDEN ENSAYOS Primero [] Segundo []

C4 VALORACION DEL CALZADO DE CALLE

P1/ NÚMERO DE MUESTRA CALZADO CALLE EMPLEADA _____

P2/ ¿Tiene alguna molestia o problema de ajuste?

P3/ El calzado **ABSORBE LOS IMPACTOS Y VIBRACIONES** que se producen durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
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P4/ El calzado **ES ESTABLE** durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
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P5/ Valoración global del **CONFORT** del calzado

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	Ni cómoda ni incómoda <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
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C5 VALORACION DEL CALZADO DE CALLE CON PLANTILLA

P1/ NÚMERO DE MUESTRA PLANTILLA NO2 EMPLEADA _____

P2/ ¿Tiene alguna molestia o problema de ajuste?

P3/ El calzado **ABSORBE LOS IMPACTOS Y VIBRACIONES** que se producen durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
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P4/ El calzado **ES ESTABLE** durante la carrera

Totalmente de acuerdo <input type="checkbox"/>	De Acuerdo <input type="checkbox"/>	Indiferente <input type="checkbox"/>	En Desacuerdo <input type="checkbox"/>	Totalmente en Desacuerdo <input type="checkbox"/>
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P5/ Valoración global del **CONFORT** del calzado

Extremadamente cómodas <input type="checkbox"/>	Muy cómodas <input type="checkbox"/>	Cómodas <input type="checkbox"/>	Ni cómoda ni incómoda <input type="checkbox"/>	Incómodas <input type="checkbox"/>	Muy incómodas <input type="checkbox"/>	Extremadamente incómodas <input type="checkbox"/>
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COMPARACIÓN

Ordene las tres condiciones en relación a los aspectos enumerados a continuación, puntuando:

- 1 para la que más
- 3 para la que menos

Si no nota diferencia se dará el mismo número de orden.

1/ PABSORCIÓN DE IMPACTOS Y VIBRACIONES durante la carrera:

CALZADO
SIN PLANTILLA

CALZADO CON
PLANTILLA NO2

2/ ESTABILIDAD durante la carrera:

CALZADO
SIN PLANTILLA

CALZADO CON
PLANTILLA NO2

3/ CONFORT general:

CALZADO
SIN PLANTILLA

CALZADO CON
PLANTILLA NO2

COMENTARIOS: