



Comparative
Biomechanical Study

High Traffic GTI® Tiles

Improve ergonomics employees in the Industry

Gerflor®

Protection and well-being of employees

Ergonomics is a key concern for manufacturers



30%

in the US manufacturing industry 30% of days away from work are due to injuries and illnesses involving musculoskeletal disorders. (Bureau of Labor & Statistics USA, 2018)



50%

of employees say that ergonomic workspaces would help them to be more productive. (Staples Business Resource, USA)



9

professional diseases out of 10 are due to musculoskeletal injury. (INRS, France)



17%

of work-related accidents are related to slips, trips and falls. (Works Accident Fund, Belgium)



Comparative Biomechanical Study GTI® Tiles vs “Hard Floors”

Framework of the study

PARTICIPATING INSTITUTES



The Interuniversity Laboratory of Motor Biology (LIBM), located on several sites in France, associates researchers in the field of physiology, biomechanics and neurosciences applied to physical and sports activities and health.



With IGR initiatives and projects, they actively support companies in achieving their health goals. The Institut für Gesundheit und Ergonomie e.V. is an association of experts in the fields of ergonomics and back health.

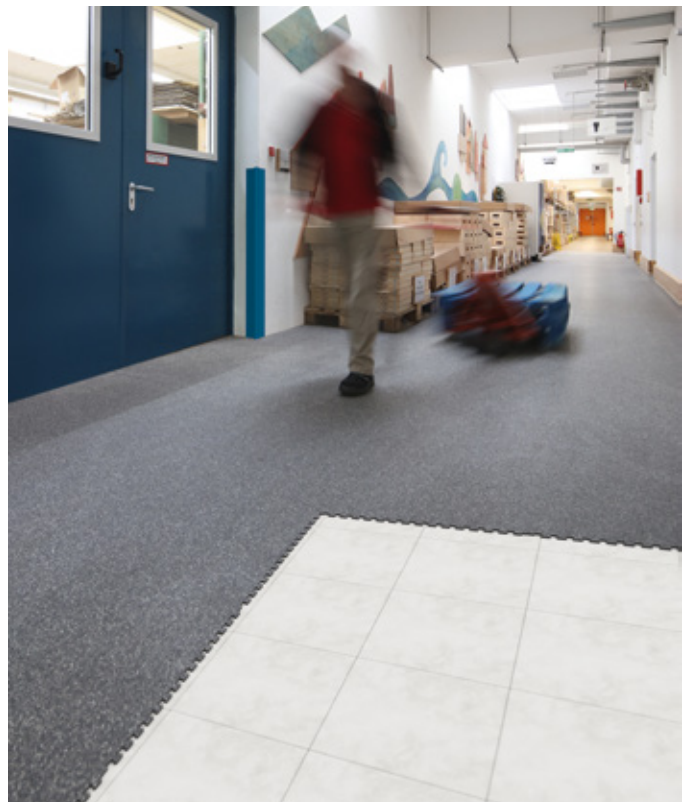
OBJECTIVE OF THE STUDY

To evaluate the contribution of GTI® tiles in reducing shocks and vibrations when walking in humans compared to a ‘hard’ floor, such as tiles, concrete or resin.

For this purpose, shock and vibration were measured in conjunction with the evaluation of muscular effort, energy expenditure and perceived comfort, in individuals performing tasks such as empty walking and load-bearing walking.

Measurements were added during more complex tasks such as handling loads, requiring a knee on the ground (LIBM).

Study to clarify to what extent Gerflor floor coverings protect the human musculoskeletal system with its joints, bones and muscles thanks to their shock absorption effect when walking and standing (IGR).



THE STUDY EQUIPMENT.....

Surface EMG electrodes, thigh, calf, lumbar

- Measurement of muscular activations

Triaxial accelerometer on the heel

- Shock and vibration measurement

Heart rate measurement

- Heart rate monitor, Polar® VANTAGE V2

Perception measurement

- Borg questionnaire (validated in medicine and sports)

Measurement of skin pressures

- Pressure sensors type W-INSHOE glued on the knee and the heel

Estimation of perceived comfort

- Evaluated with a visual analog scale

Walking analysis

- Medilogic system.



OBSERVED POPULATION

Population

- Men and Women

Age moyen

- 39 years (+/- 10 years)

Average height

- 5.6 feet (+/- 0,3)

Average weight

- 68kgs (+/- 10kgs)

OBSERVED IMPACTS WITH FLOORS



Muscular efforts,
(Loaded and unloaded)



Perceived comfort
(Loaded and unloaded)



Shocks and vibrations
(Loaded and unloaded)



Pressure on the knees

Comparative Biomechanical Study GTI® tiles vs “Hard Floors”

The benefits of GTI tiles
for employees



*Average observed value

Detailed results of the study

Reduction in walking effort		Unloaded	Loaded (9kg)
Reduction of the step frequency over a given distance	Regular shoes	-6.3%	-
	Safety shoes	-0.6%	-
Reduced muscle activation during walking	Regular shoes	-12.9%	-7.6%
	Safety shoes	-11.9%	-10.5%

IMPROVEMENT OF propulsive EFFICIENCY
by better grip of the foot on the ground. Decrease of the muscular efforts to provide.

Improved perceived comfort and fatigue when walking		Gain
Walking comfort	Perceived Fatigue (Borg Questionnaire)	-15.6%
	Perceived comfort	+21.1%
	Walking stress	-7.5%

IMPROVING PERCEIVED COMFORT
Decrease in perceived fatigue.

Improvement of the comfort on the floor		Gain
Comfort on the floor	Unipodal stability	+18%
	Global pressure	-38%
	Infra-patellar bursa	-40%
	Anterior tibial tuberosity	-50%
	Perceived	+200%

DECREASE OF 38%
in the the sum of the pressures on the knees. A better distribution of pressure.



“Our study has shown that GTI® High Traffic Tiles reduce shock and muscular effort while reducing perceived fatigue and improving user comfort, compared to a concrete surface. A significant reduction in the level of muscular activation for the same performance was observed, as well as a limitation of the vibratory behaviour of the muscle at low frequencies, which correspond to the resonance frequencies of human tissue. Thus, GTI® High Traffic Tiles allow for a significant reduction in mechanical stress and should therefore reduce the risk of injury to users.”

Christophe HAUTIER,
Director of the Research Unit of the Interuniversity Laboratory of Biology and Motricity at the Lyon site.

GAIN IN COMFORT BY REDUCING RISKS FOR THE WELL-BEING AND PRODUCTIVITY:

- Reduction of fatigue
- Improved comfort
- Reduction of shocks
- Improved productivity



Range GTI® Acoustic Comfort

Noise reduction compare to “hard floor”:

	Gain
	Noise of cart rollers (vs. tiles)
	-8db
Impact on noise pollution	Impact on the ground
	-4db
	Noise of footsteps
	-17db

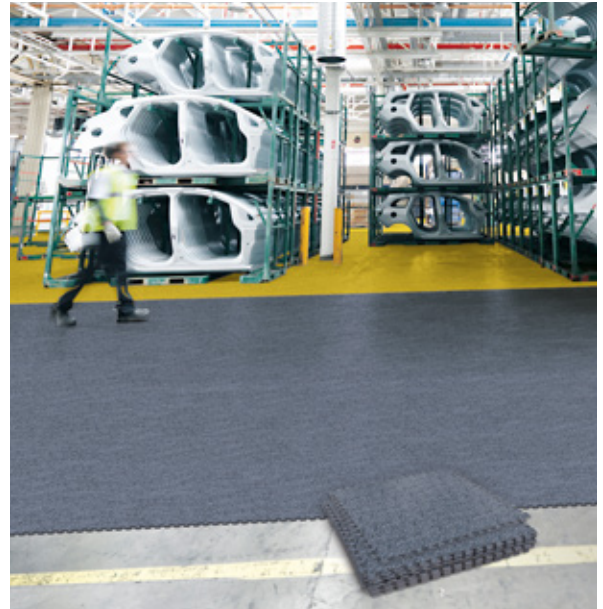
9 dB** average reduction in footfall, falling objects and rolling noise:

- **Improve the well-being of employees**

Reducing noise pollution contributes to limiting stress, irritability, as well as improving productivity.

- **Protecting employees**

Reducing noise pollution helps to limit the risk of accidents and hearing problems in the short and long term.



Safety by floor zoning

Facilitate the organization of spaces

- **Wide choice of colors**

Contribute and facilitate the implementation of a security induced by the marking.

- **Customized security logo**

Allows you to integrate your security protocols.

- **Integrated marking**

Increased resistance over time and adjustable with your organizations.



**Comparative study of GTI® tiles vs. ceramic carried out by the Gerflor technical department

High Traffic GTI[®] by Gerflor[®]

A complet range of solutions

- **Connect version: “plug and play” assembly**

Allows for quick implementation.

- **Free standing**

Allows installations in occupied areas and localized maintenance.

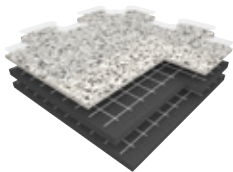
- **Cleantech versions (hot welded joints)**

Compatible with controlled environments.

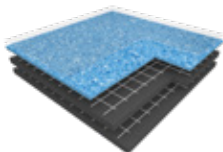
- **Patented surface treatment**

High resistance to chemical and mechanical aggression, improved durability.
Compatible with cleaning and decontamination protocols.

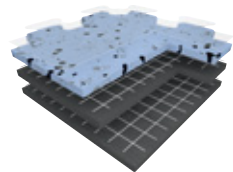
AVAILABLE VERSIONS



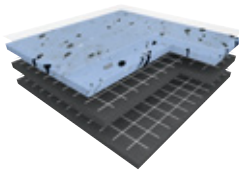
GTI[®] MAX Connect



GTI[®] MAX Cleantech
Watertight solution



GTI[®] EL5 Connect
ESD solution



GTI[®] EL5 Connect
Watertight and
ESD solutions

GTI[®] MAX CONNECT.....

