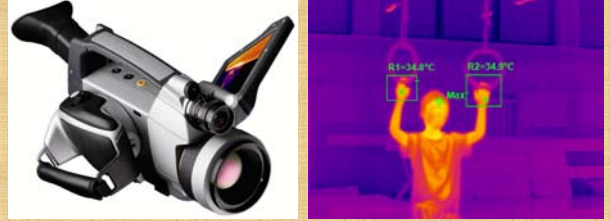


Thermoimaging in gymnastics

Ivan Čuk

Thermal camera is similar to normal video camera, the main difference is chip which detects temperature instead of light .

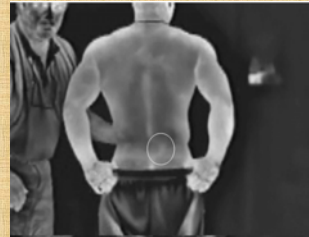


Thermal imaging can be used at least in:

- medicine diagnostics and
- research.

Diagnostics:

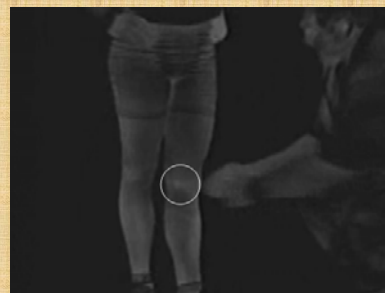
William A. Sands, Jeni R. McNeal and Michael H. Stone: THERMAL IMAGING AND GYMNASTICS INJURIES: A MEANS OF SCREENING AND INJURY IDENTIFICATION, Science of Gymnastics Journal, 2011, 2, p.5-12



Male athlete with lower back pain. Note the warmer (lighter) area on the right side of his lumbar spine and sacrum



Female athlete with dramatically inflamed areas bilaterally and superior to her sacroiliac joints



Female athlete with an area of knee pain.



Research at Faculty of Sport and Faculty of Electrical Engineering with Ph.D. Igor Pušnik

Palm temperature of students with simple elements (one leg circle forward; long swing on rings)

- differences for use magnesium carbonate or not
- differences between first attempts and well known elements
- differences between bar and rings

Palm temperature of high performance athletes

- on high bar when performing 5 giant swings
- on uneven bars when they use safeguards or not use them
- on pommel horse when performing 15 double leg circles

Differences for use magnesium carbonate or not – students beginners

	Temperature before long leg circle	Temperature after 1 st one leg circle	Temperature after 2 nd one leg circle	Temperature after 3 rd one leg circle
Without magnesium	°C	°C	°C	°C
ca	33,23	33,31	33,46	33,64
sd	1,64	1,41	1,24	1,40
p t-test previous/next	0,54	0,35	0,34	
p t-test 1st/last				0,07
p t-test without/with	0,34	0,00	0,00	0,00
With magnesium				
ca	33,71	34,69	35,30	35,29
sd	1,07	0,96	1,57	1,41
p t-test previous/next	0,02	0,05	0,95	
p t-test 1st/last				0,01

7 students - beginners performed 3 one leg circles forward with and without magnesium on wooden bar. After each attempt they showed palms to measure temperature.

Without magnesium temperature do not change

With magnesium rises

Differences for use magnesium carbonate or not – students with good knowledge

18 students - performed 3 one leg circles forward with and without magnesium on wooden bar. After each attempt they showed palms to measure temperature.

No differences between use of magnesium, palm temperature rise for 2 degrees Celsius

Differences between rings and wooden bar

18 students showed 8 intermediate long swings (from backswing to forwardswing and to backswing again) on wooden rings

	N	Mean	Std. Deviation	Std. Error	Sig.	
Left palm	1 before without	18	35,039	,9268	,2185	0,000
	2 before with	18	34,694	,9570	,2256	0,006
	3 after load	18	33,556	1,2358	,2913	
Right palm	1 before without	18	35,017	,8604	,2028	0,000
	2 before with	18	34,778	,8286	,1953	0,001
	3 after load	18	33,483	1,1408	,2689	


Temperature lowers!!!!

Top gymnasts at 2013 Wcup Ljubljana weather wrist bandage changes temperature of palm


32 gymnasts while performing their exercise on pommel horse

We could not confirm any results, as there were problems with in vivo measurements


Slovene gymnasts 2014 performing 15 double leg circles



Measured 6 gymnasts, in average 1,5 degrees Celsius lower temperature

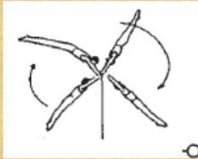


Bertonec Before




After


World Cup Ljubljana 2014 gymnasts performing 5 giants backward



Measured 9 gymnasts, in average 0,5 degrees Celsius lower temperature




Zonderland Before




After

World Cup Ljubljana 2014 women gymnasts performing 5 giants backward on uneven bars

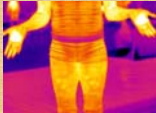


Measured 6 gymnasts without safeguards, in average 4,2 degrees Celsius higher temperature


Measured 7 gymnasts with safeguards, in average 1,4 degrees Celsius lower temperature




Pavlova without Before



After



Stabinger with Before



After

Questions?