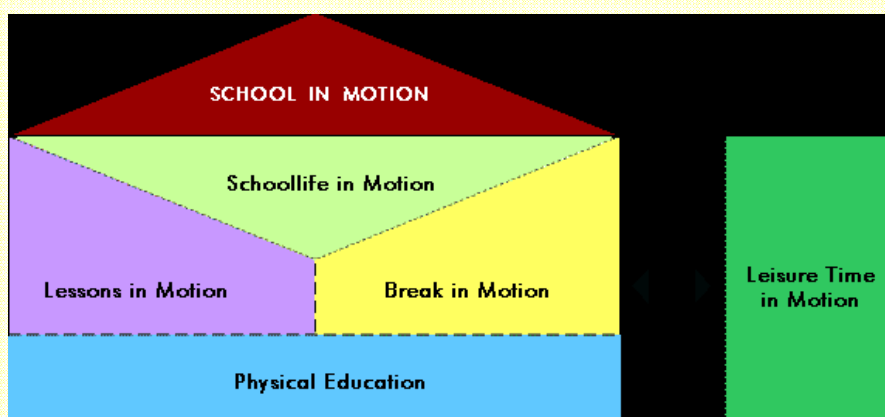




## Measuring the oxygen supply to the brain of children by means of near infrared spectroscopy under the “Moving School” project.

Christian Andrä    Christian König    Prof. Dr. Müller    OA PD Dr. med. Knüpper

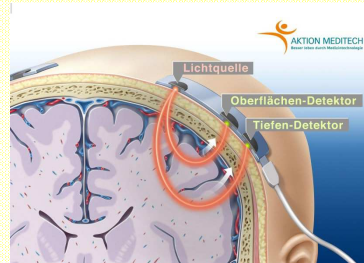
## Project: „Moving school“



<http://www.bewegte-schule-und-kita.de>

## Methodology I: Nearinfrared-spectroscopy (NIRS)

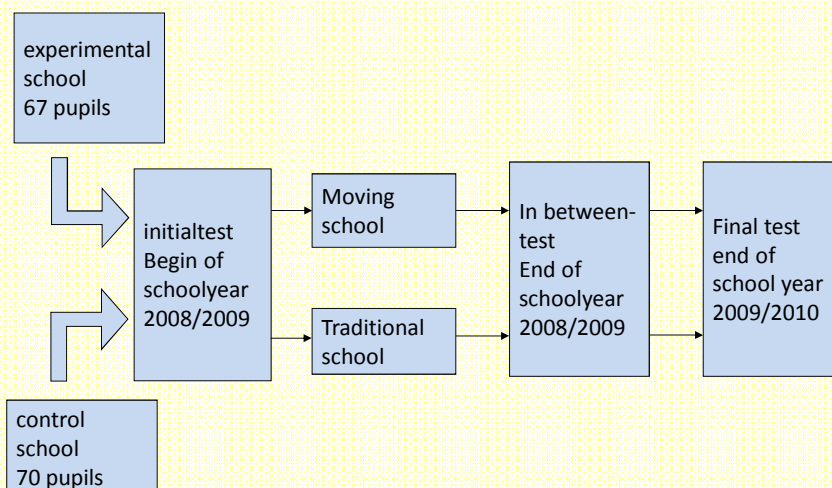
- infrared light up to 3 cm
- shallow and deep sensor
- O<sub>2</sub>HB hemoglobin vs. HHb
- absorption-wavelengths:  
810, 730 nm



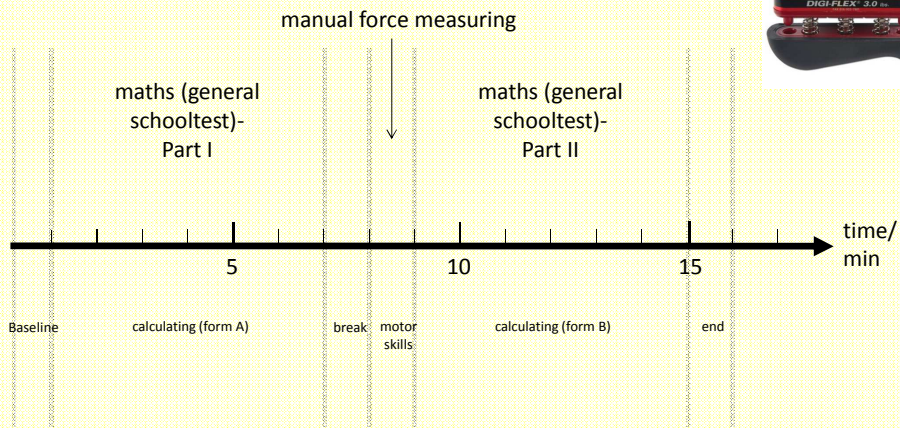
→ algorithm: regional blood circulation

(O<sub>2</sub>- supply, O<sub>2</sub>- consumption)

## Methodology II: structure of the investigation

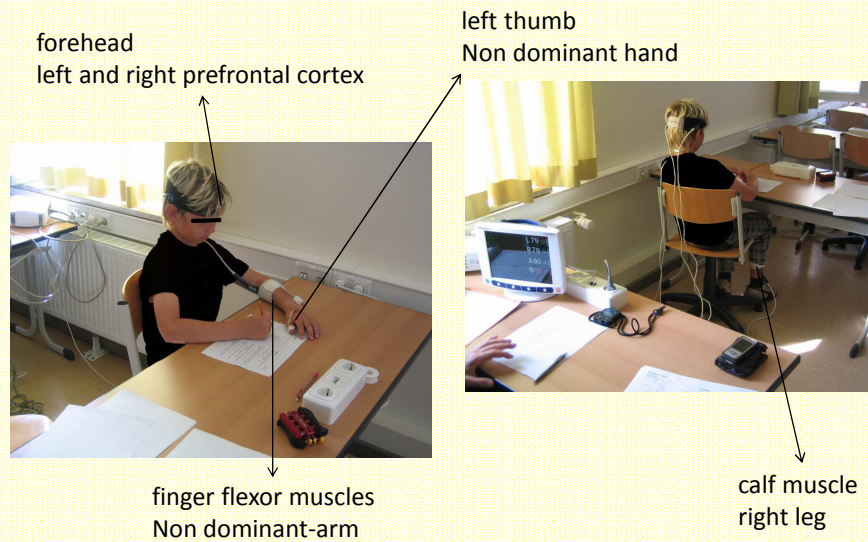


## Methodology III: examination procedure and used tests



- Additionally with all pupils in the classroom: concentration-test (D 2)

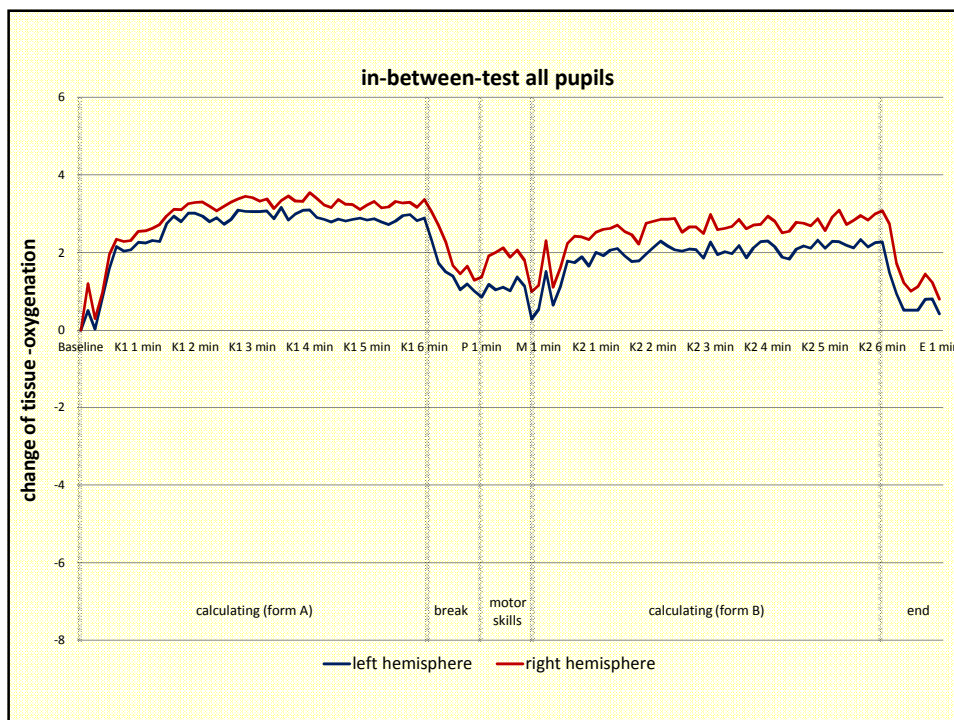
## Methodology IV: application

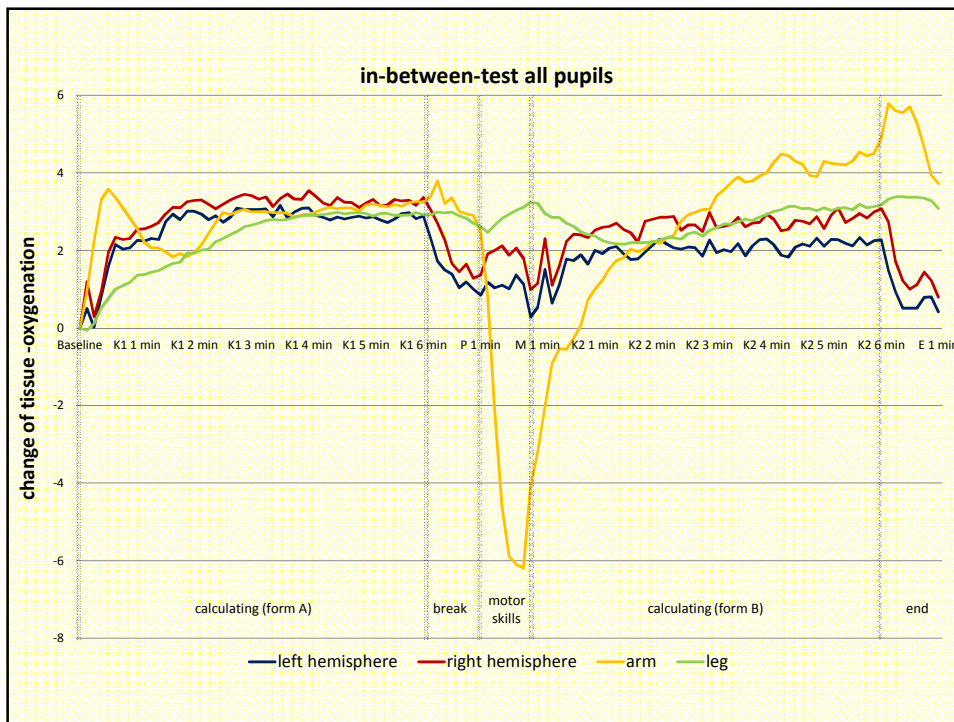
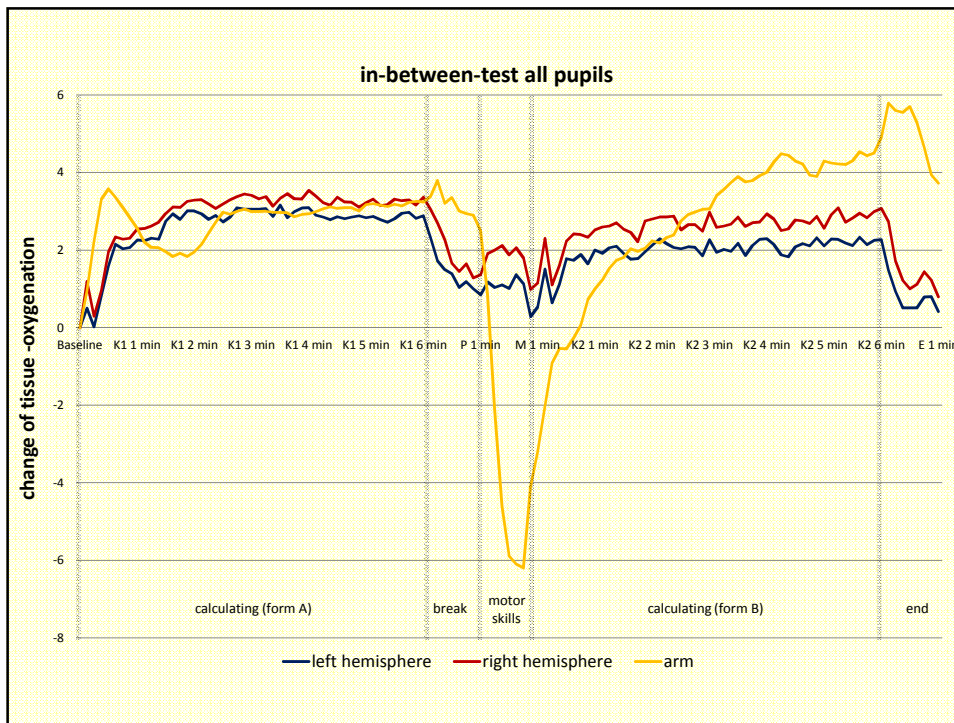


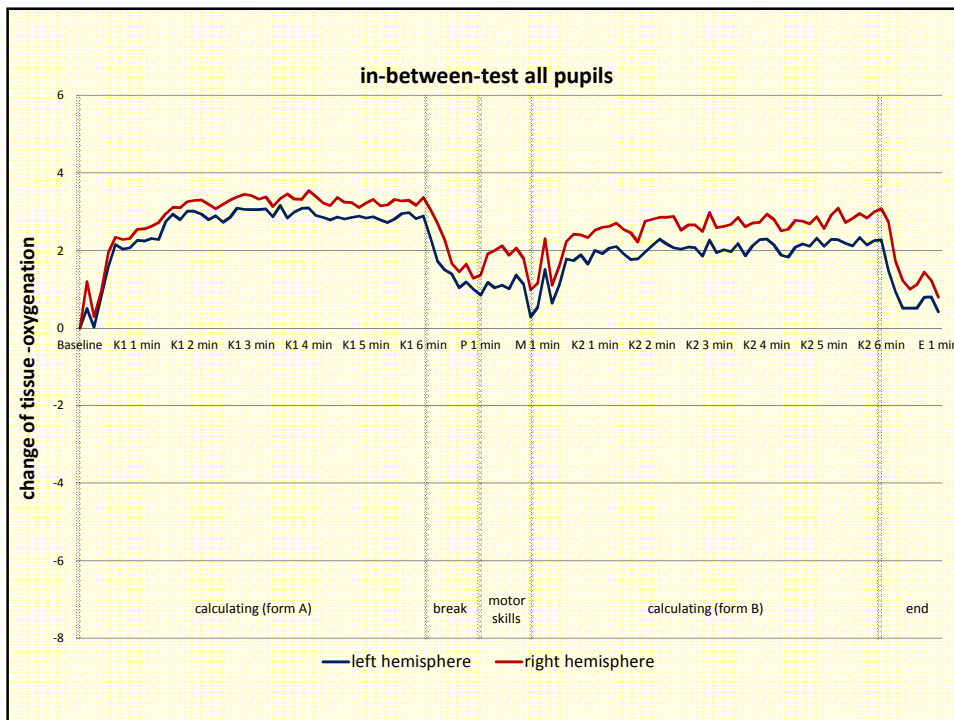
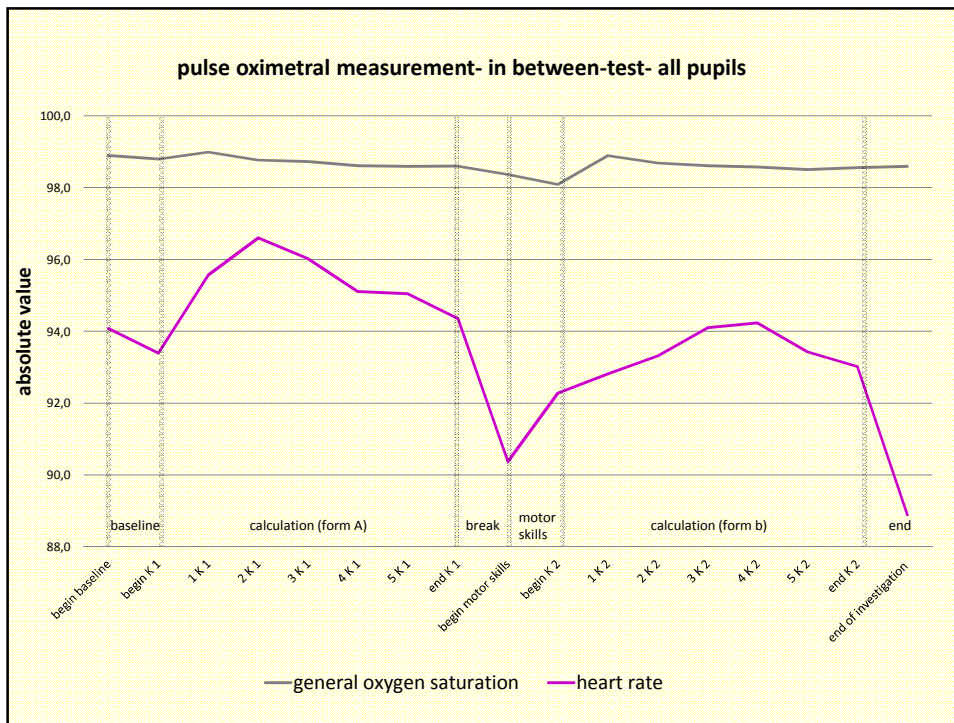
## key aspects

concerning the two school-concepts:

- diverse results in psychological tests (maths and concentration) ?
- different oxygen supply in brain and muscles ?



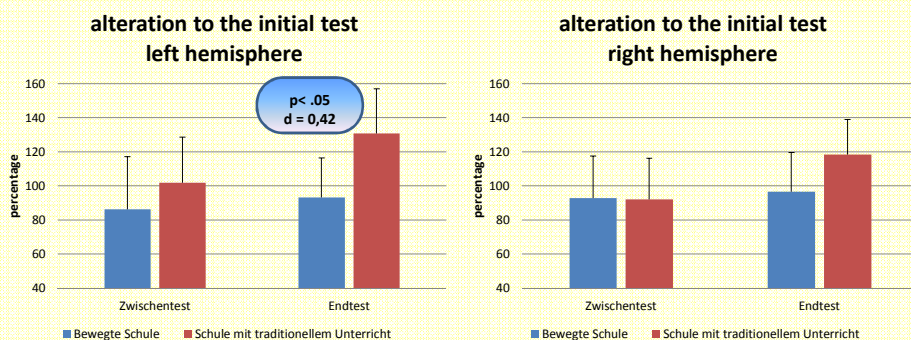




## general insights

- Data display changes, although not just at the brain (above all: contralateral arm, but also leg are being explicit activated as well)
- Examination values not pure selective (additional factors: cardiovascular system)

## alteration of tissue oxygenation among cognitive exposure

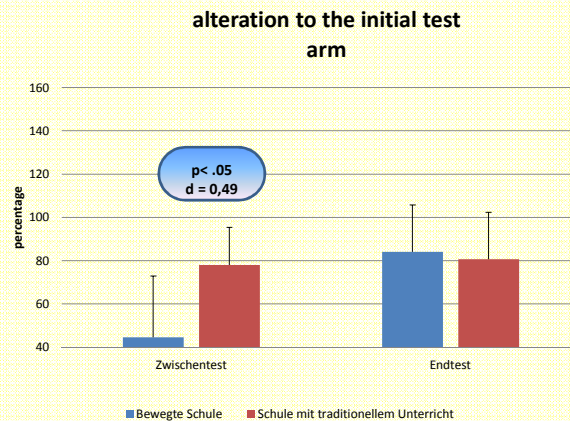


Hypothese: pupils of „Moving school“ with more neuronal efficiency<sup>3</sup>  
→ process of training-induced economisation occurs<sup>4</sup>

<sup>3</sup> Haier et al., 1993

<sup>4</sup> Hollmann & Strüder, 2001

## alteration of tissue oxygenation among cognitive exposure



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## summary

- testsystem to investigate effects of „moving school“ in an objective way
- No difference in performance tests (maths and concentration after two years)
- „Moving school“:
  - fewer blood circulation during cognitive tasks (neuronal efficiency, training-induced economisation)
  - children of traditional schools supposedly reach their individual performance limit earlier



Thanks for your attention!



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Anhang

# DYNAMICAL SITTING

Change between front, middle and back sitting posture



Change of the posture by working cross legged, in dorsal or prone position



Relief of the spinal column by the **relieving postures** while writing, reading and listening.

## Ergebnisse I: Stichprobe

	Versuchsschule = bewegte Schule	Kontrollschule
Anzahl Schüler	67	70
männlich	42	40
weiblich	25	30
Klasse 2	22	33
Klasse 3	45	37

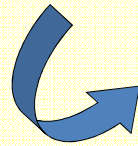
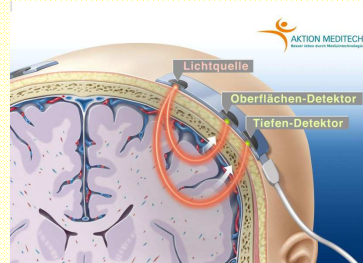
Aktivität im Gehirn: → Verbesserung  
der lokalen Sauerstoffversorgung



Nachweis über Messung der  
Gewebeoxygenierung



NIRS könnte objektive Methode sein  
um Unterschiede festzustellen



NIRS ausgewählt, um Effekt der  
„Bewegten Schule“ objektivieren zu können;  
schlechte Alternativen (z.B. EEG, f MRT) –