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Outline of an empirical study on the effects of emotions on strategic behavior in virtual emergencies

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Interdisciplinary research project
at Freiburg Institute for Advanced Studies (FRIAS)

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Outline

- Motivation and research goals
- Realization with our VR setup
- Empirical study and preliminary results
- Outlook and discussion

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„Coping with emergencies“

Immediate Goals:

a) Research on aspects of emotion regulation as traits and as coping behavior in simulated emergencies
b) Modeling of emotions in combination with action planning and decision making in emergencies
c) Development of different VR scenarios, helpful for training of coping strategies

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„Coping with emergencies“

And in the long run..

- Developing a research paradigm:
  a) to simulate emergencies
  b) to assess psychological trauma responses
- Assessing the effects of simulated emergencies, e.g., do certain styles of emotion regulation lead to
  a) decreased problem solving and
  b) increased psychophysiological reactivity

Realization

The experiment has to allow for:

1. experimental conditions that are:
   - Controllable
   - Systematically modifiable
2. the acquisition of:
   - Subjective & bio-metrical data
   - Behavioral performance data

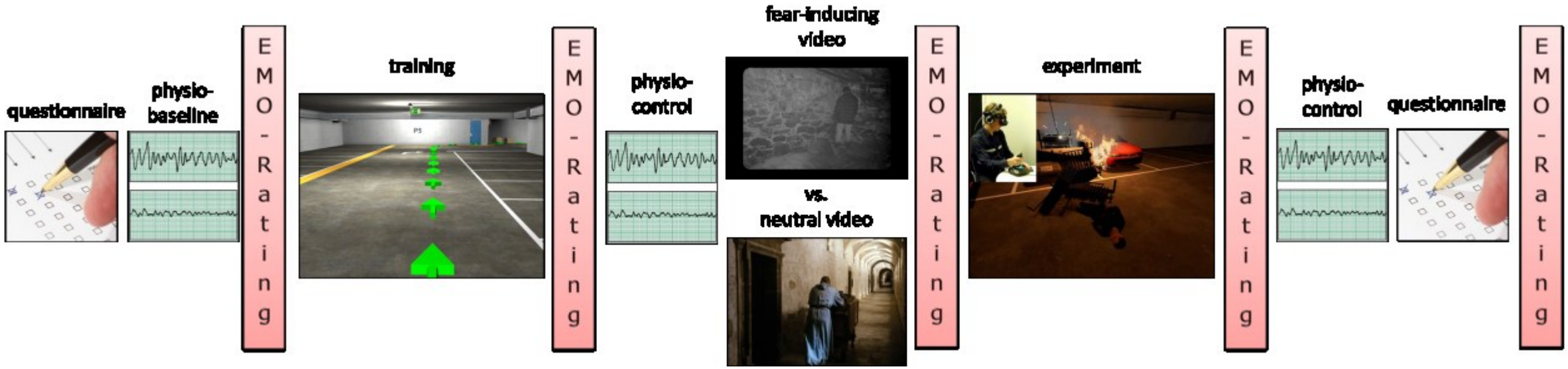
Coping behavior in emergencies

- VR-Technology:
  - Head-mounted display (HMD) with head tracking and headphones
  - Joystick: Moving / interacting with the virtual world
  - Modification of the „Source 2007“ game engine (Half-Life 2)

- Emotion detection:
  - Questionnaires before and after the experiment
  - Physiological data:
    - Skin conductance, heart rate, respiration
    - Marker channel to synchronize with VR


Bewältigungsverhalten
in Notfallsituationen
Demo-Video

Design



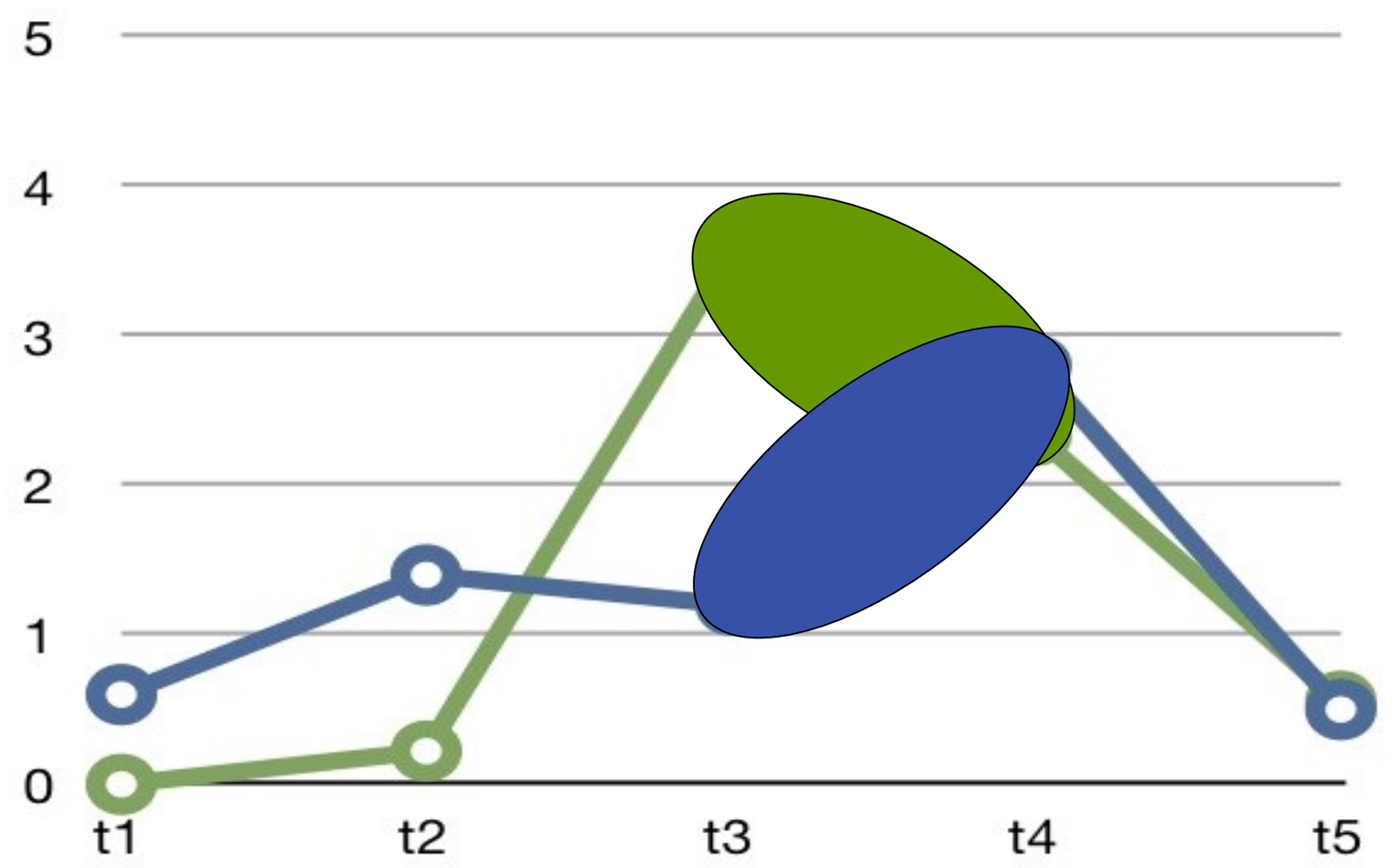
EMO-Rating

- Intensity rating scale for the emotions:
  fear, anger, shame, blame, joy, sadness, and arousal
- 10 point visual-analogue-scale from 0=“not at all” to 10=“extreme”

Preliminary results:

fear group

no-fear group

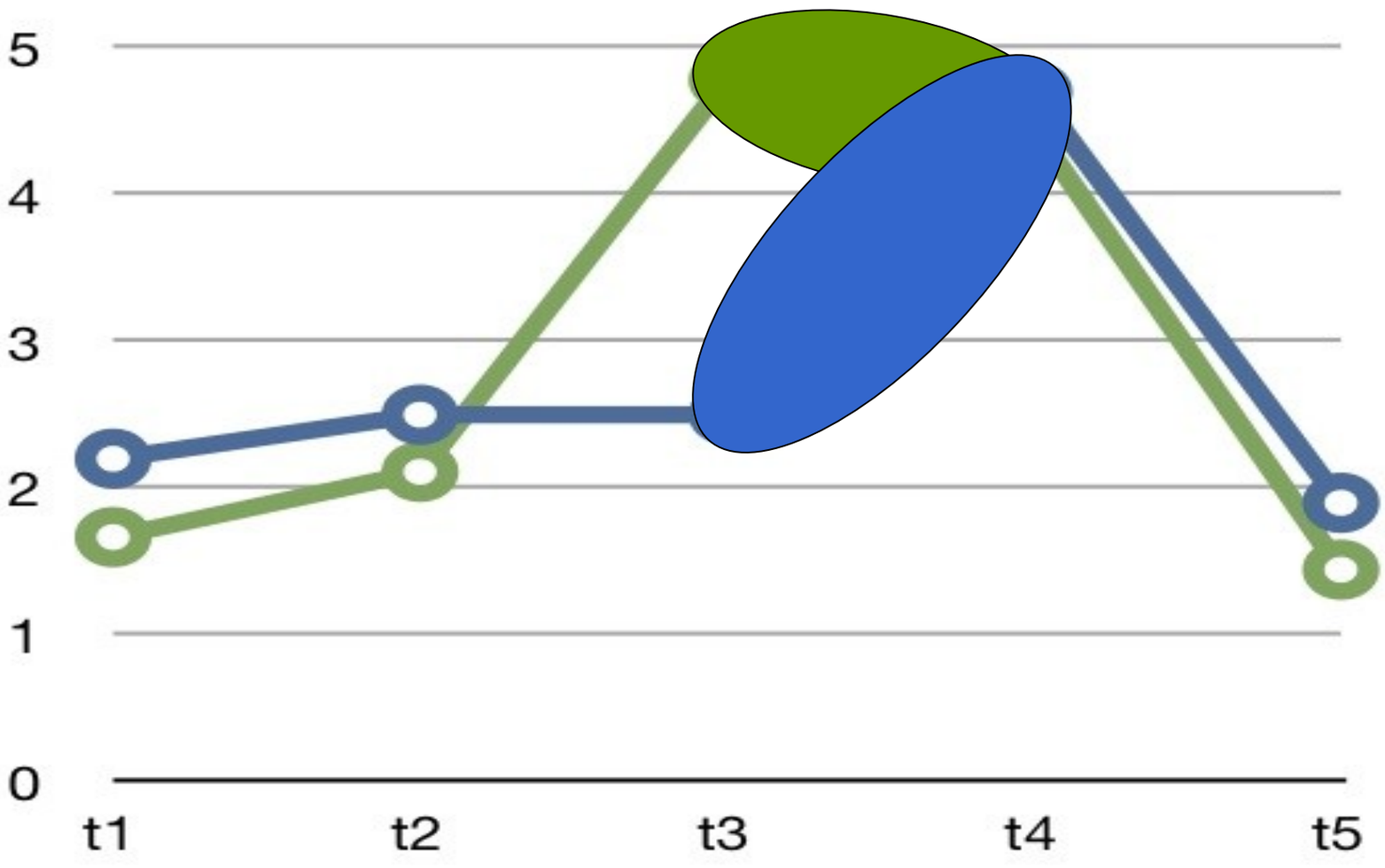


Preliminary results:

Arousal

fear group

no-fear group



heart rate
estimated marginal means
85,00
82,50
80,00
77,50
75,00
72,50
Baseline
Training
1. Minute Notfall
Erholung
time
p < 0.0001
higher arousal

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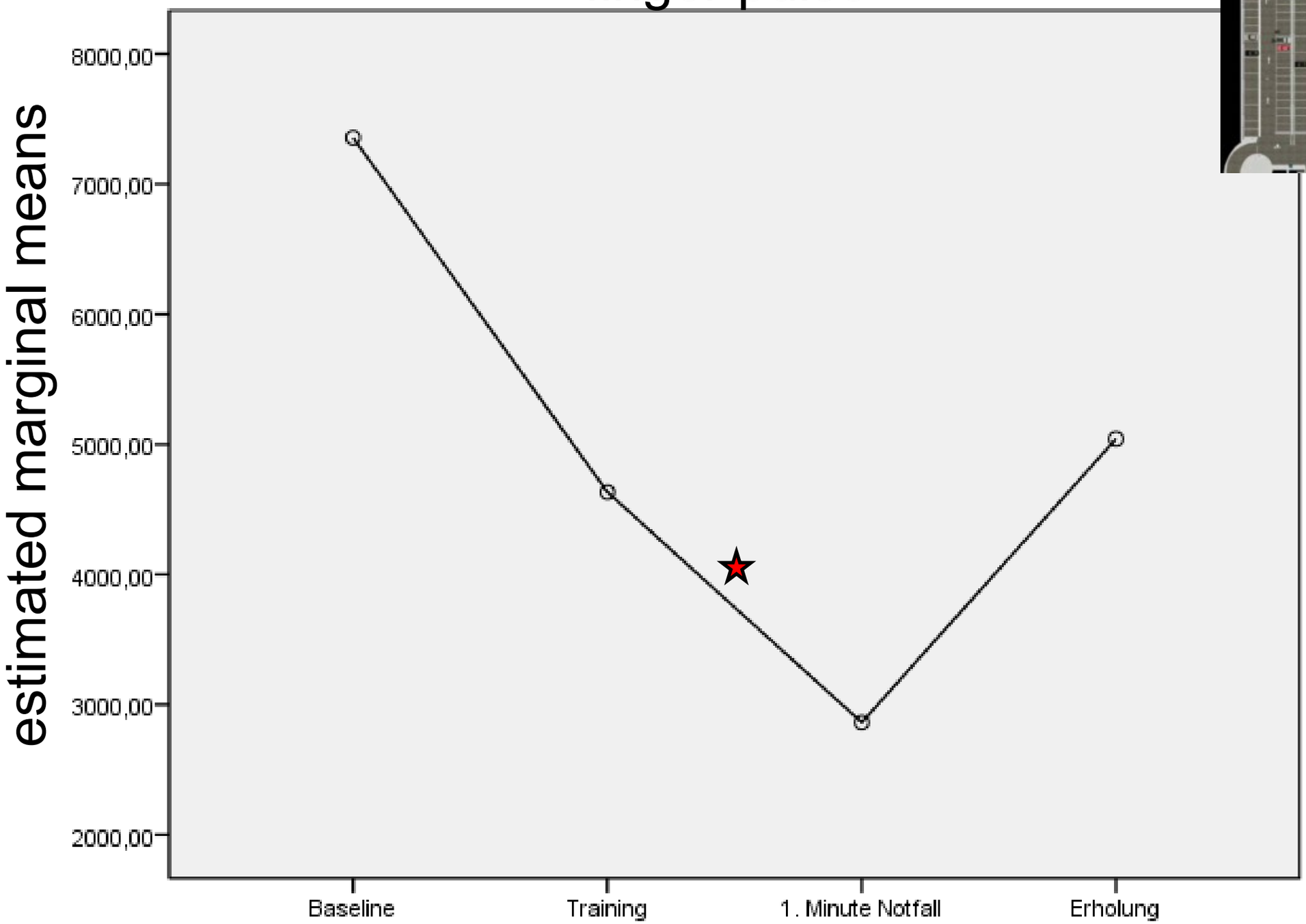
finger pulse



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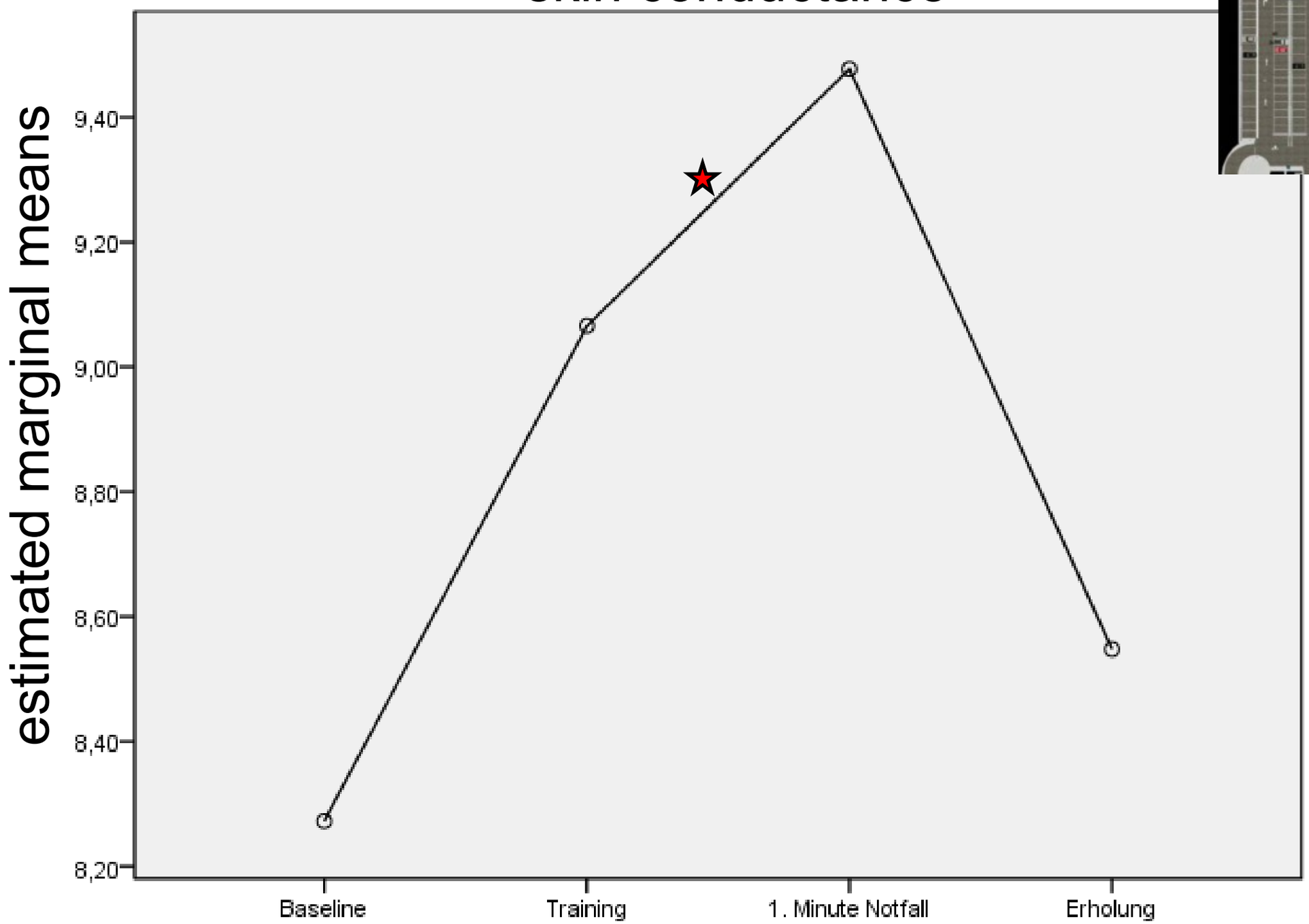
skin conductance
estimated marginal means
9,40
9,20
9,00
8,80
8,60
8,40
8,20
Baseline
Training
1. Minute Notfall
Erholung
time
p < 0.0001
higher arousal

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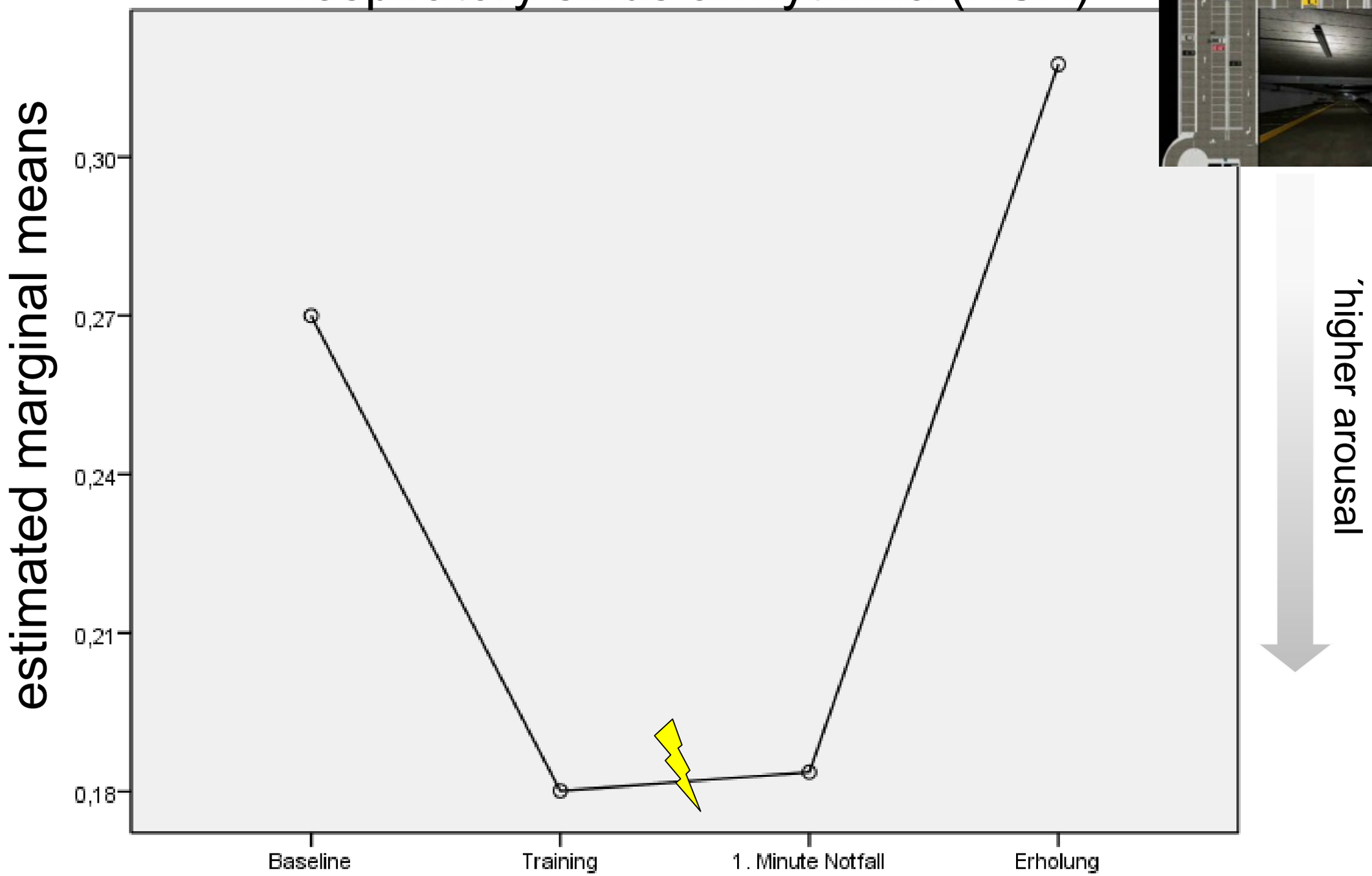
respiratory sinus arrhythmia (RSA)



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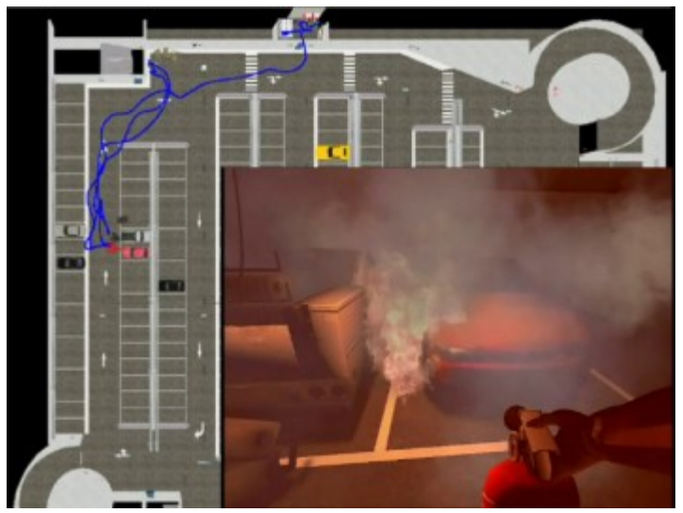
Behavioral data

	points	call emerg.	take fire exting.	address person	exting. fire	take elevator	take stairs	take car exit
Exp. (9)	∅ 32	78%	89%	44%	78%	22%	67%	11%
Ctrl (10)	∅ 26	50%	50%	60%	50%	20%	70%	10%
f (14)	∅ 25	64%	57%	50%	50%	21%	71%	7%
m (5)	∅ 38	60%	100%	60%	100%	20%	60%	20%

Increasingly complex scenarios



Challenges for artificial intelligence:

- Integration of emotions to increase the believability of virtual agents
  - Expression of emotions
  - Simulation of dysfunctional emotions (panic, shock)
- Goal selection and prioritization based on emotions during behavior planning of virtual agents
- Social interaction of multiple agents
- Cooperation between humans and agents

→ Behavior planning / decision making and emotion

Summary & Outlook

- Experience of emotions and emotion control are important factors for coping with emergencies
- Practically no previous research on coping with emotions during emergencies
- Online acquisition of psycho-physiological indicators and behavioral data during simulated emergencies

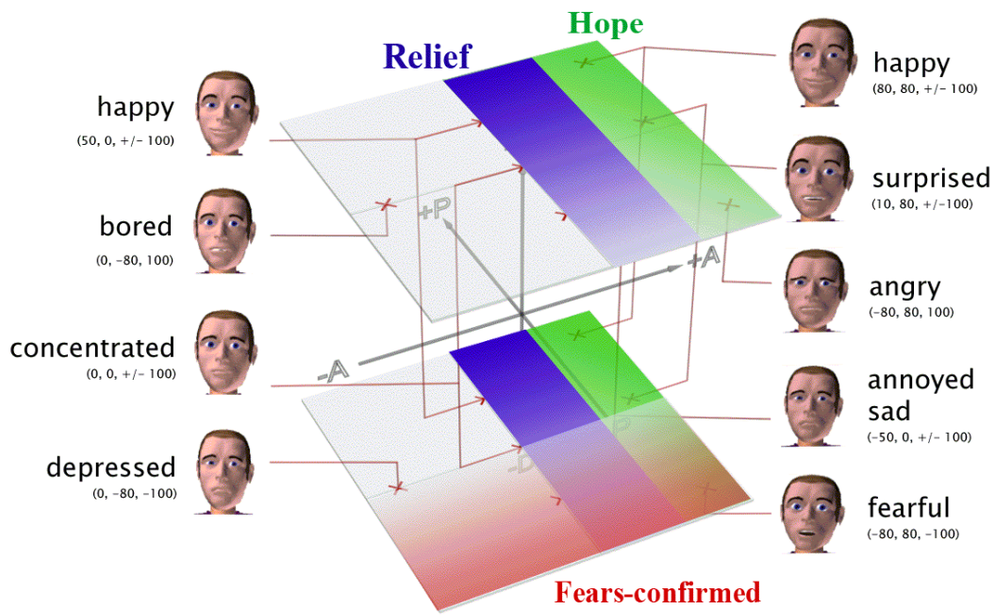
➢ Impact of styles of emotional coping (suppression vs. verbal report of emotional experience) on performance?

➢ Transferability to training scenarios based on AI methods

➢ Modelling „shame“ or „guilt“ with AI-methods?

Virtual agent‘s emotion simulation: WASABI

- Affect simulation engine WASABI
- Open source (LGPL)
- Collaboration very welcome via GitHub, go to: https://www.becker-asano.de/ → WASABI



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