

Behavioral and neural underpinnings of positive/negative treatment expectations, and their effects on pain

Helena Hartmann¹, Katharina Schmidt¹, Angelika Kunkel¹, Alina Kulka¹, Franziska Frysch¹, Stefan Glass¹, Katja Wiech^{1,2}, & Ulrike Bingel¹

¹ Center for Translational Neuro- and Behavioral Sciences (C-TNBS) and Department of Neurology, University Hospital Essen, Germany

² Wellcome Centre for Integrative Neuroimaging (WIN), Nuffield Department of Clinical Neurosciences, University of Oxford, UK

INTRODUCTION

- Pain can be **modulated by positive and negative treatment** expectations induced by a combination of verbal instructions and classical conditioning^{1,2}.
- More research is needed to **identify shared and distinct neural mechanisms underlying placebo and nocebo effects** in the same paradigm and individual.
- Especially the **formation and temporal dynamics** of placebo and nocebo effects need to be further investigated^{3,4}.



Research objective

What are the **temporal dynamics and neural mechanisms** underlying the formation and effects of positive and negative treatment expectations in pain?

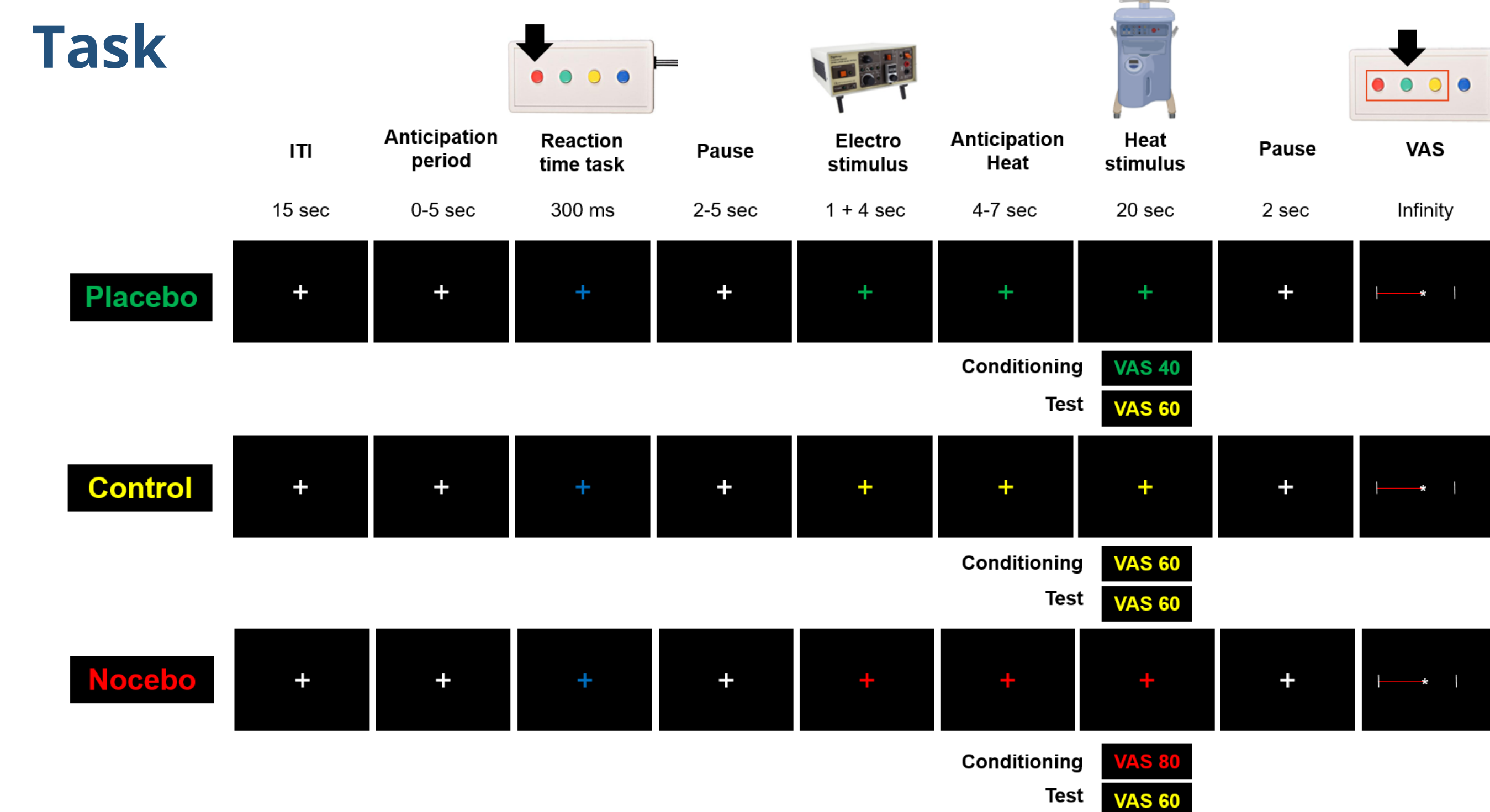
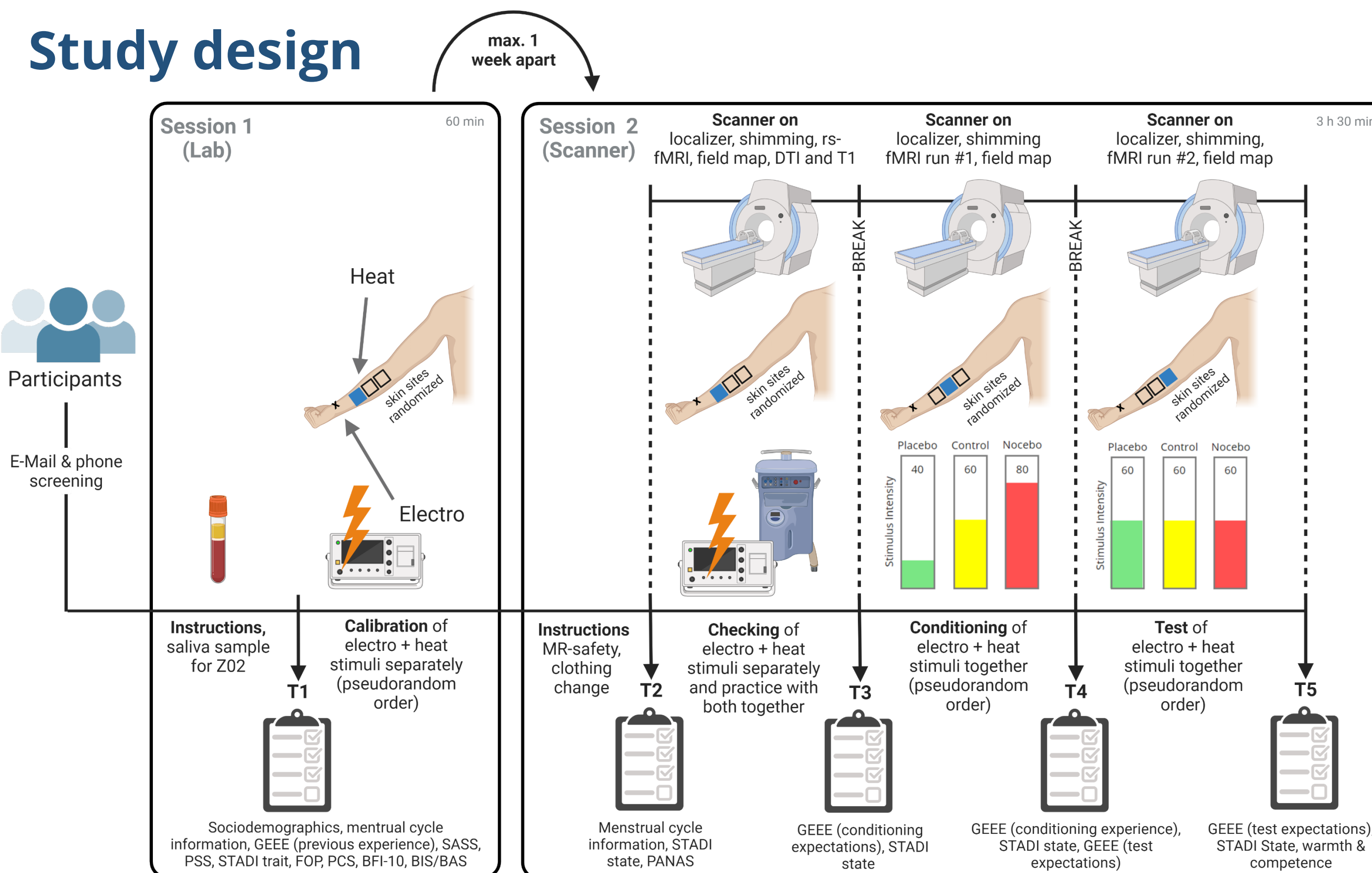


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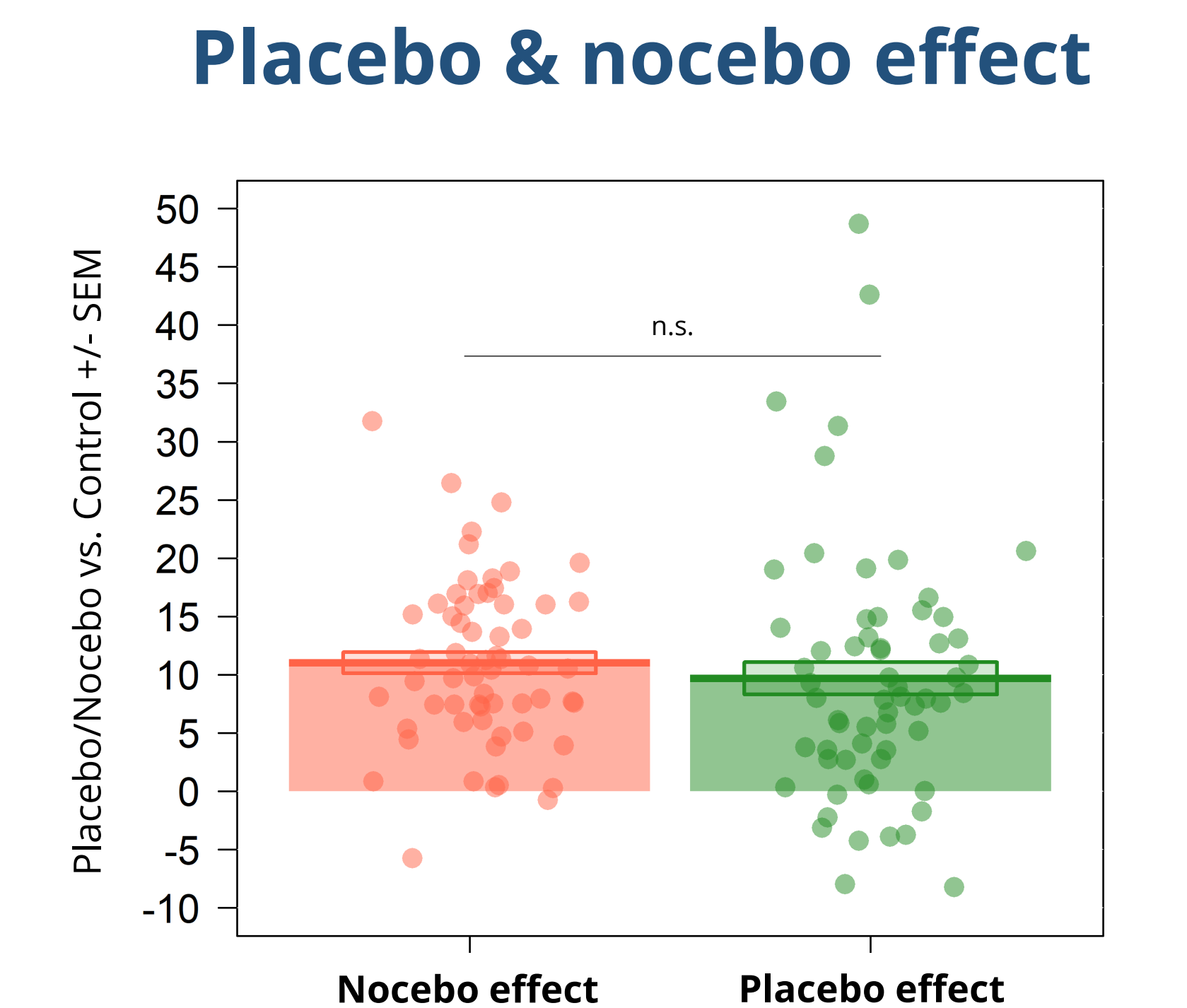
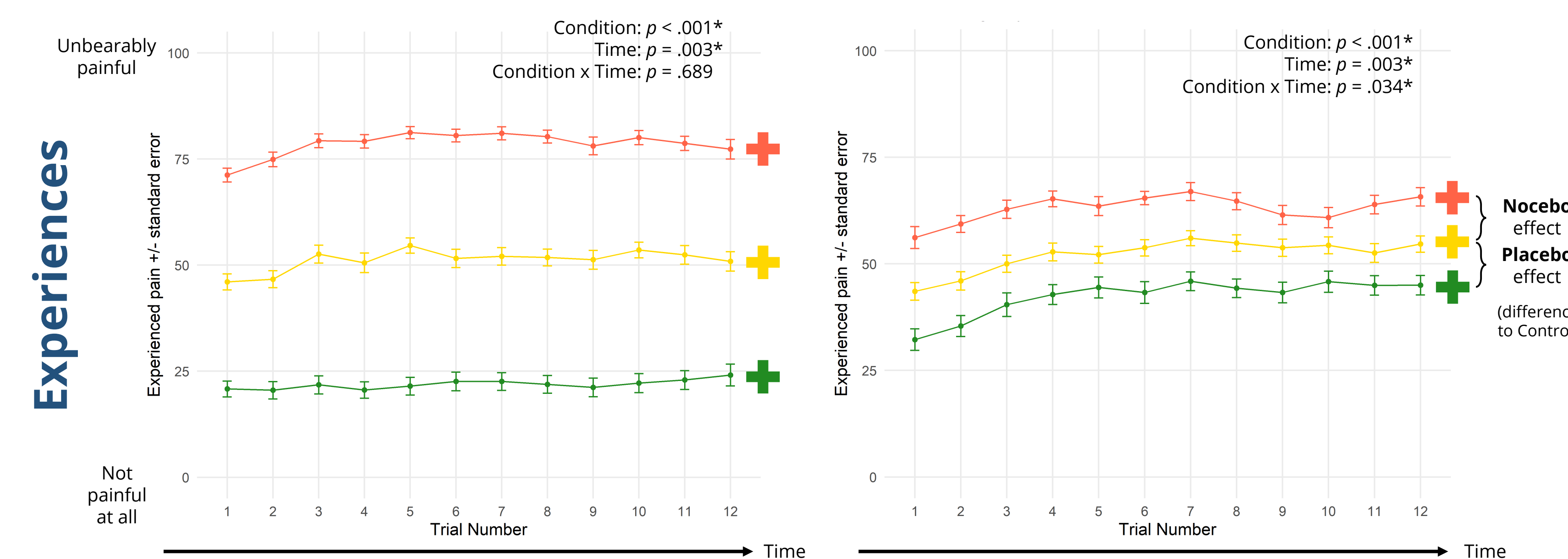
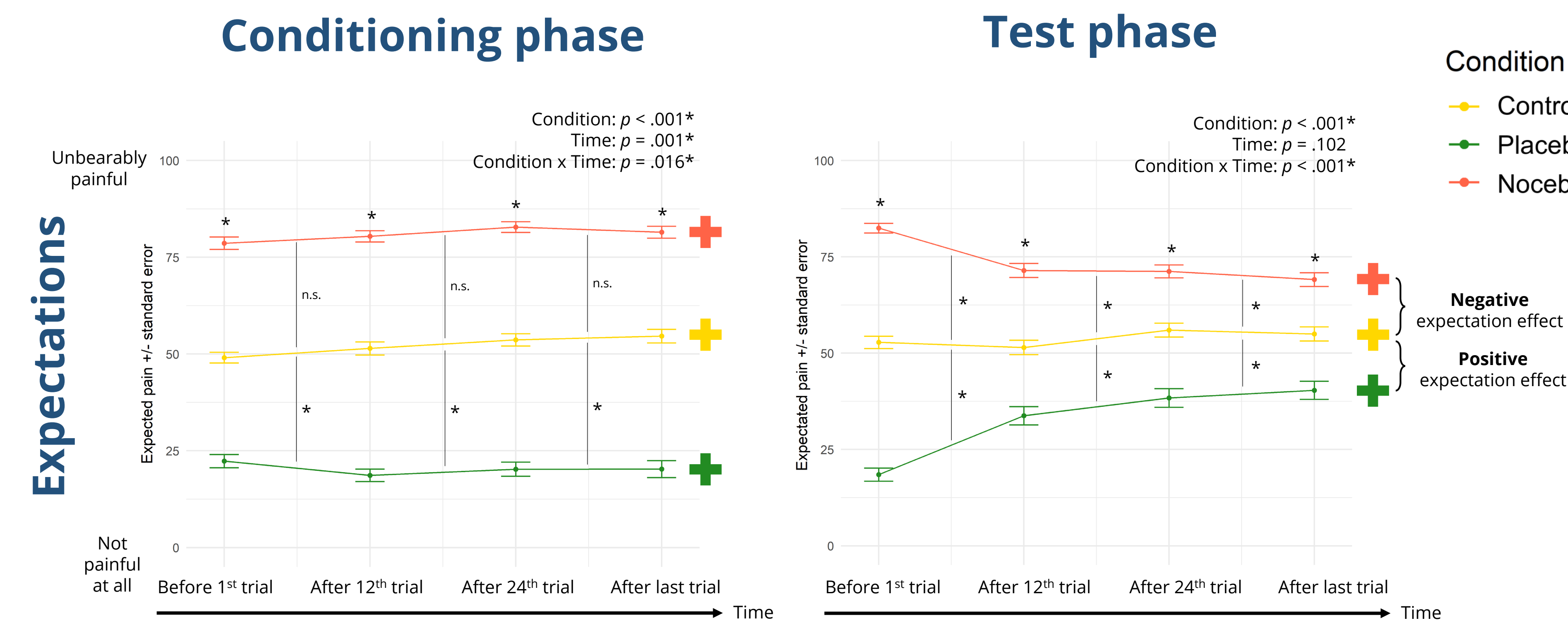


METHODS

- Preregistered** before start of the data collection (<https://drks.de/search/en/trial/DRKS00031993>).
- Established **model of verbally instructed and conditioned placebo hypoalgesia and nocebo hyperalgesia⁵** using a within-subject design and fMRI.
- Two scanning runs:
 - Expectation formation** during conditioning with experimental reinforcement of positive or negative treatment experience
 - Placebo/nocebo test session** without such reinforcement
- Outcomes**
 - BOLD responses
 - Expectation ratings (4x per condition = 12x per phase)
 - Pain ratings (12x per condition = 36x per phase)
- Sample**
 - 62 participants (mean age ± SD = 24.11 ± 3.09, aged 19-37 years)
 - 30 males and 32 females
- Neuroimaging analyses and 6-12-month follow-up** ongoing.



PRELIMINARY RESULTS



DISCUSSION

- Successful induction of both positive and negative expectations**, the effects of which are still present when pain is kept constant in the Test phase.
- No difference in the strength** of the placebo and nocebo effects in the Test phase.
- This study reveals **new insights into the formation and time course of positive and negative treatment expectations**, and their effect on pain processing and perception.

REFERENCES

- Benedetti et al., 2022
- Colloca & Barsky, 2020
- Colagiuri et al., 2015
- Rooney et al., 2023
- Colloca et al., 2010

Statistical models: Expectation or Pain ~ Condition*Time + (1 | Subject)

Abbreviations: SD = standard deviation; (rs-)fMRI = (resting-state) functional magnetic resonance imaging; BOLD = blood oxygen level dependent; DTI = diffusion tensor imaging; T1 = T1-weighted anatomical; ITI = inter-trial interval; VAS = visual analogue scale; n.s. = not significant; SEM = standard error of the mean.

CONTACT



Dr. Helena Hartmann

0000-0002-1331-6683
helena.hartmann@uk-essen.de
@helenahartmann



Personal website