Cognitive Affective Maps Tools: Proposing Multiple Software Solutions to Collect and Analyze Belief Systems

livMatS

Julius Fenn[1,2], Florian Gouret[2], Michael Gorki[1,2], Lisa Reuter[2], Wilhelm Gros[1,2], Paul Hüttner[2], Andrea Kiesel[1,2]

[1] Cluster of Excellence *liv*MatS, University of Freiburg, [2] Institute of Psychology, University of Freiburg, Germany

Introduction Cognitive-Affective Maps

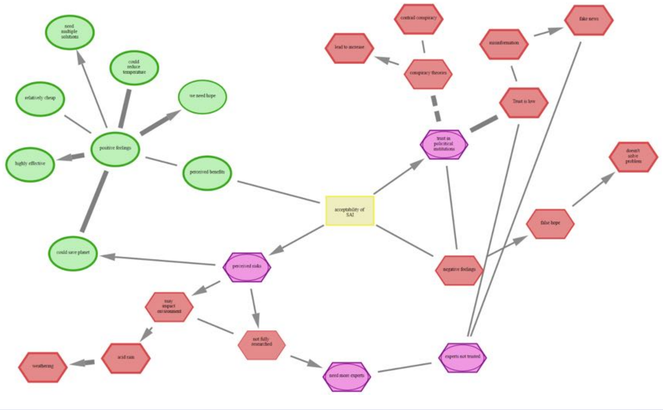
With Cognitive-Affective Maps (CAMs), it is possible to identify and visually represent any kind of declarative knowledge, whereby belief systems of participants are represented as a group of interconnected concepts with emotion values. Concepts are changed or added if they correspond to the „most coherent account of what we want to understand“ (*coherence theory*; conceptualized within the HOTCO model, see Thagard 2006).

Elements of a CAM:

- Participants can freely add concepts (also called nodes), which are linked by connections (also called edges)
- Concepts incorporate so-called affective valences by representing whether a person associates positive (green), negative (red), neutral (yellow) or ambivalent (purple) emotions with a drawn concept
  - It is possible to specify the connections in different strengths in two different forms (supporting and inhibitory connections)

Example

Figure 1 An example of a CAM regarding the perceived acceptability of a climate technology drawn by a participant in the study of Fenn, et al., 2023



Developed Cognitive Affective Maps Tools

Data collection - Cognitive-Affective Map Extended Logic (C.A.M.E.L.)

C.A.M.E.L. is an open-source software to draw Cognitive-Affective Maps. It aims to offer people an easy and intuitive interface on which they could drawn their own mind map within online studies. There is a participant view and a researcher view to set up studies. Currently it is possible to change 11 parameters of the C.A.M.E.L. software (e.g. force to full screen, or change language to Chinese).

Data analysis - CAM-App

The CAM-App follows the principle of a classical data-analysis pipeline, which is composed of two steps:

Preprocessing part: Using multiple modules you can summarize your CAM data semi-automatically (e.g. sophisticated language models are implemented). Further, you can train raters, e.g. your student assistants, to summarize your CAM data and report statistics for inter-rater-reliability.

Analysis part: Your so summarized data by the preprocessing part can be subsequently analyzed using multiple implemented functions, e.g. calculate everything from the simple absolute frequency a given concept was used to neural networks to identify groups of similar CAMs.

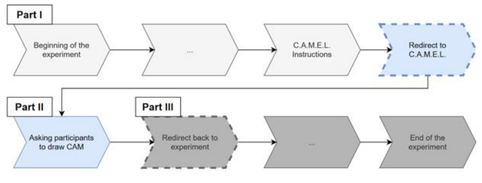
Data collection - Cognitive-Affective Map Extended Logic (C.A.M.E.L.)

We set up an administrative panel to set up and configure CAM studies easily and guarantee highest privacy standards (hosted on university BW-cloud; under development): https://drawyourminds.de/

Set up a Cognitive Affective Maps Study

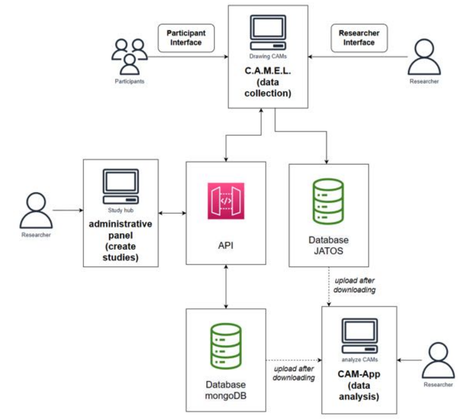
A online CAM study typically consists of three parts (c.f., Fenn et al., 2023; Reuter, 2022): (1) a context is set up for the participants (e.g., welcome screen, informed consent) and participants receive instructions on how to use the C.A.M.E.L. software to draw CAMs, (2) participants draw their CAM and finally (3) participants answer follow-up questions:

Figure 2 Three parts of a self-administrated online CAM study; Note: the dashed lines indicate a redirect between different parts / servers.



Relations of developed tools

Figure 3 Overview of the developed CAM tools



References

Fenn, J., Helm, J. F., Höfele, P., Kulbe, L., Ernst, A., & Kiesel, A. (2023). Identifying key-psychological factors influencing the acceptance of yet emerging technologies–A multi-method-approach to inform climate policy. *PLOS Climate*, 2(6), 1–25. https://doi.org/10.1371/journal.pclm.0000207

Reuter, L. (2022). Bridging Over the Troubled Waters of Quantitative and Qualitative Methods: Exploring Cognitive-Affective Maps in Empirical Research [PhD Thesis, University of Freiburg, Germany]. https://www.psychologie.uni-freiburg.de/Members/lreuter/Reuterdiss

Thagard, P. (2006). Hot Thought: Mechanisms and Applications of Emotional Cognition. MIT Press.

Further information

central webpage

https://drawyourminds.de/

link poster

Acknowledgements

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Contact

Julius Fenn, Dr.

E-Mail: julius.fenn@psychologie.uni-freiburg.de

Phone: +49 761 203 9153

Statistical Modeling in Psychology
Freiburg Heidelberg Landau Mannheim Tübingen

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