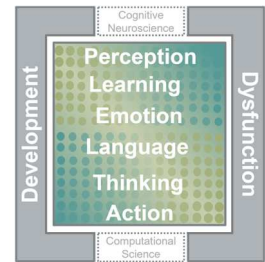


Interim Summary: Activities and Measures (Dec. 2022)

Modal and Amodal Cognition: Functions and Interactions



Activities and measures taken during the first funding period

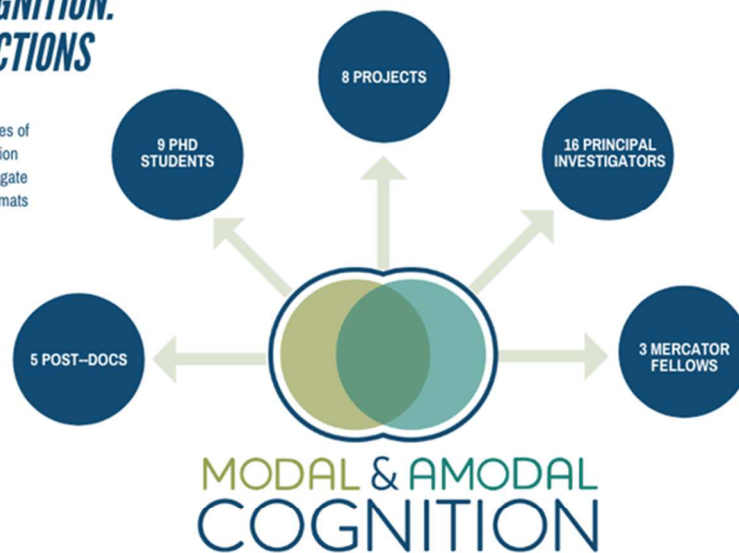
The distinction between modal and amodal representations has always been particularly relevant and theoretically fruitful in the psychology of perception and language. In other subfields of psychology, this distinction has been less prominent, presumably because different terminologies were used for similar principles. Therefore, in the first funding period, this research group explored whether evidence for modal and amodal representations can be demonstrated in various subfields of psychology. Despite the pandemic limitations of laboratory experiments, all projects were able to show empirically in many cases that this distinction is psychologically plausible and thus fundamental for almost all areas of psychology. Structurally, we supported these combined research efforts through a number of measures and activities within and beyond our research unit.

MODAL AND AMODAL COGNITION: FUNCTIONS AND INTERACTIONS

The question of how the human mind represents the internal and external world plays a crucial role in theories of human cognition. Central to this question is the distinction between modal vs. amodal representations. We investigate functions and interactions of these representational formats in different subfields of cognition, as well as their development and their role in cognitive dysfunction.

PROJECT MANAGEMENT

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Co-Speaker:
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In this document, we will outline how our research unit is structured and describe its working procedures. We will report the specific measures that were taken to foster exchange and collaboration within the group and beyond, to support early-career researchers, to ensure equality and diversity within the group, to stimulate open science practices and to increase national and international visibility.

Composition and structure of the research unit, steering committee, and advisory board

From the outset of our activities, we have emphasized the ability to take structured actions and guarantee high transparency of decision-making processes within the research unit. In our first members' assembly in October 2020 we set up internal rules of procedure and established a steering committee for the research unit. It consists of the spokesperson, the deputy spokesperson, and the coordinator, as well as two PIs from the center strand, one PI from the overarching projects, one post-doctoral researcher, and one doctoral student. All positions with more than one possible allocation were filled by vote in the first members' assembly. The steering committee meets regularly (twice a semester) to decide on proposals concerning equality measures, workshops, retreats, association of new members, etc., as well as to discuss general procedures of the research unit concerning colloquia, data handling, public relations, etc.

We also appointed an external advisory board including nationally and internationally renowned experts on various aspects of cognitive representations and psychological functions. These researchers have agreed to support and advise the individual projects and the whole unit in the scientific and strategic aspects of their work. We had a kickoff event to introduce the advisory board. Since then, several individual activities have been taking place between members of our research group and members of the advisory board. In addition, the advisory board will join a meeting with the steering committee in January 2023 to discuss longer-term scientific directions based on the extension proposals. We had planned that all advisory board members would visit the research unit during the first funding period, which turned out to be difficult because of pandemic travel restrictions. However, Tessa Warren visited for ten days this year, and a visit by Daniel Bub and Jaffa Yeshurun is planned for 2023.

Finally, once per year, a general members' assembly is held in which spokespersons and steering committee report on their activities, new members are formally associated, and structural as well as scientific aspects surrounding the research unit are discussed and decided.

Members of the steering committee: Barbara Kaup (spokesperson), Rolf Ulrich (deputy spokesperson), Karin Bausenhardt (coordinator), Carolin Dudschig (center strand), Hans-Christoph Nürk (center strand), Donna Bryce (overarching projects), Nicoletta Simi (post-docs), Kathrin Reichmann (doctoral students).

Members of the advisory board: Rasha Abdel-Rahman (HU Berlin), Daniel Ansari (University of Western Ontario), Daniel Bub (University of Victoria), Tessa Warren (University of Pittsburgh), Yaffa Yeshurun (University of Haifa), Jeff Zacks (Washington University in St. Louis).

Members of FOR 2718 at group retreat Obermarchtal (Sep. 2022). From left to right: B. Kaup, M. Ramscar, V. Franz, D. Dignath, R. Ulrich, M. Janczyk, H. Leuthold, H. Mallot, J. Svaldi, J. Heller, C. Friedrich, D. Bryce, A. Glenberg, J. Steil, N. Simi, L. Eichfelder, M. van den Hoek Ostende, K. Bausenhart, U. Schwarz, D. Kohler, D. Pecher, C. Dudschig, M. Huff, M. Mittenbühler, L. le Vinh, T. Potamianou, R. Johansson. Photo: P. Smith.



Principal investigators: Donna Bryce (B1), Martin Butz (A5), Carolin Dudschig (A4), Volker Franz (A2), Claudia Friedrich (B1), Caterina Gawrilow (B2), Jürgen Heller (A1), Mandy Hütter (A3), Markus Janczyk (A2, A4), Barbara Kaup (C, A3, A6), Hartmut Leuthold (A4), Hanspeter Mallot (A6), Hans-Christoph Nürk (A5), Michael Ramscar (A3), Jennifer Svaldi (B2), Rolf Ulrich (A1, A6).

Post-doctoral researchers: Karin Bausenhart (C, A6), Julia Huber (A5), Johannes Lohmann (A5), Ulrike Schwarz (B2), Nicoletta Simi (A4).

Graduate students: Kriti Bathia (A2), Lea Eichfelder (A2), Robert Johansson (A1), Dorina Kohler (A1), Lilian le Vinh (A6), Maximilian Mittenbühler (A5), Theodora Potamianou (B1), Kathrin Reichmann (A3), Jessica Steil (B1), Mechteld van den Hoek Ostende (B2).

Associated members: Asya Achimova, Linda Bräutigam, Francesca Capuano, David Dignath, Martin Giese, Markus Huff, Ian Grant Mackenzie, Victor Mittelstädt, Katharina Naumann, Krisztina Orbán, Lilly Roth, Nadia Said, Theresa Sorg, Parker Smith, Claudio Tennie, Hong Yu Wong, Charley Wu.

Activities involving advisory board members:

- Kickoff-event with advisory board, April 12, 2021.
- Collaboration between Kaup/Ulrich (A6) and Yaffa Yeshurun concerning the mental timeline.
- Collaboration between Nürk (A5), Daniel Ansari and the NGO *My Oral Village* concerning concrete and abstract number processing in uneducated samples in Sierra Leone, resulting in SSHRC (Social Sciences and Humanities Research Council - Canada, File Nr 892-2021-3041) funding to Daniel Ansari with Nürk as a collaborator.
- Collaboration between Kaup (A6) and Rasha Abdel-Rahman concerning embodiment in language production.
- Collaboration between A6 and Daniel Bub concerning distance-dependency of action effects.
- Planned visit of Daniel Bub in May 2022, had to be rescheduled (final date tbd).
- Visit of Tessa Warren June 29 – July 8, 2022.
- Planned visit of Yaffa Yeshurun March 2023.

Established task forces

Additionally, we have formed several task forces in charge of developing ideas for measures regarding various domains overarching the scientific program of the research unit. Each of these task forces on equality measures, open science, PhD support, activities and workshops, and science communication is composed of research-unit members at different career stages and from different projects to enable a creative and diverse approach to the tasks and challenges in each of the domains. Concepts and ideas developed by the task forces are presented to the steering committee for approval and, if applicable, get implemented by Project C.

- **Equality measures:** Karin Bausenhart (A6), Carolin Dudschig (A4), Jessica Steil (B1), Jennifer Svaldi (B2)
- **Open Science:** Kriti Bhatia (A2), Volker Franz (A2), Markus Huff (Ass.), Dorina Kohler (A1), Hans-Christoph Nürk (A5)
- **PhD student support:** Donna Bryce (B1), Kathrin Reichmann (A3), Ulrike Schwarz (B2), Charley Wu (Ass.)
- **Activities & workshops:** Francesca Capuano (Ass.), Lea Alexandra Eichfelder (A2), Nicoletta Simi (A4)
- **Science Communication:** Hartmut Leuthold (A4), Lilian LeVinh (A6), Hans-Christoph Nürk (A5), Mechteld van den Hoek Ostende (B2)

Research colloquium / Journal club

We established a weekly research colloquium/journal club for members of the research group and interested guests. Overall, we had a mixture of talks focusing on general theoretical issues, experimental results, and impulse presentations. We invited a series of well-established as well as early-career researchers as external speakers. Also, members of the research group

presented their work, and potential common research themes and project developments were discussed. The online format, originally developed to overcome pandemic-related restrictions, proved incredibly inclusive and fruitful for allowing many external and internal participants and bringing together views of researchers across different universities, departments, and workgroups. We plan to continue this successful format in the future.

External Speakers: [Rasha Abdel Rahman](#) (HU Berlin), [Anna Borghi](#) (Bologna), [Anne Briemann](#) (MPI Tübingen), [Alfonso Caramazza](#) (Harvard), [David Dignath](#) (Tübingen), [Chris Erb](#) (Auckland), [Michael Gilead](#) (Tel Aviv), [Arthur Glenberg](#) (Arizona State), [Thor Grünbaum](#) (Copenhagen), [Greg Hickock](#) (UCI), [Markus Huff](#) (Tübingen), [Attila Krajsi](#) (Eötvös Loránd), [Yuqi Liu](#) (Chinese Academy of Science), [Brad Mahon](#) (Carnegie Mellon), [Christian Michel](#) (Edinburgh), [Uta Noppeney](#) (Birmingham), [Jared Novic](#) (Maryland), [Diane Pecher](#) (Rotterdam), [Roland Pfister](#) (Würzburg), [Katrina Quinn](#) (Tübingen), [Florian Sandhäger](#) (Tübingen), [Charles Spence](#) (Oxford), [Tessa Warren](#) (Pittsburgh), [Bodo Winter](#) (Birmingham), [Hong Yu Wong](#) (Tübingen), [Charley Wu](#) (Tübingen).

Workshops

Despite the pandemic, we regularly brought members of the research unit together for workshops and research retreats in various formats (online, in presence, and hybrid). Across three group retreats, members had the opportunity to present and discuss the status of their work. A dedicated retreat for the PhD students and postdocs of the group

Summer Retreat in Obermarchtal.



comprised workshops centered on scientific writing practices and tools, as well as career planning and perspectives. In addition, we organized a number of specific methods workshops on experimental programming and (online) data collection, meta-analysis, and mixed-effects modeling. These method workshops were very well received by our PhD students and postdocs, but also by other interested members of the research unit and beyond.

12.	Oct	2020:	Kickoff Event
19./26.	Jan	2021:	Workshop: (Online-)Experimenting with PsychoPy and jsPsych
17./18.	Jun	2021:	Virtual Retreat
15./16./17.	Sep	2021:	Summer Retreat Heiligkreuztal
21./22./28.	Sep	2021:	Methods workshop "Mixed effects modeling in R"
28.	Mar	2022:	Progress Report Meeting
31.	May	2022:	Workshop: "Basic concepts of meta-analysis (part I)"
7./28./29.	Apr	2022:	PhD students and Postdoc retreat Heidelberg
13.	Sep	2022:	Workshop: "Basic concepts of meta-analysis (part II)"
21./22./23.	Sep	2022:	Summer Retreat Obermarchtal

We plan to continue these activities in the remaining time of this funding period. Currently, a methods workshop on Bayesian hypothesis testing is planned. At the end of the funding period, we plan to hold a conference with invited external guests and expert speakers on the topic of mental representation, possibly surrounded by student workshops and/or a summer school dealing with representational issues.

Mercator fellows and visiting researchers

We appointed three internationally acknowledged researchers with expertise in different areas of cognitive psychology (e.g., action and perception, learning, etc.) as Mercator fellows: Diane Pecher (Erasmus University Rotterdam), Arthur Glenberg (University of Arizona)¹ and Jeff Miller (University of Otago). Diane Pecher and Arthur Glenberg each visited the research group several times for longer periods ranging from two to four weeks, and further visits of Diane Pecher are planned for 2023. They have taken part in colloquia and group retreats, and they have provided valuable advice and support to the members of the research group, particularly to graduate students and early-career researchers. In addition, they have reviewed and advised us on the state of our scientific progress and our plans for extending this work in the following funding period. Jeff Miller has not yet been able to visit due to unforeseen pandemic-related restrictions. However, he is planning to resume the fellowship at the next opportunity. We therefore propose transferring the amount granted for his visit to the next funding period. In addition, scientific exchange and international visibility have been promoted through a research visit from Tessa Warren, University of Pittsburgh. We invited several international researchers to visit us during the remainder of this funding period as the planning uncertainties associated with the pandemic situation progressively ease (Roberto Bottini, James McClelland, Uta Noppeney). We also invited national and international early-career scientists in order to help them overcome adverse pandemic-related effects on collaboration opportunities, scientific exchange, and networking (Nasrin Sedaghatgoftar, Farhangian University, Iran; Denise Stephan, University of Aachen, cf. circular mail from DFG, "Senats-AG Pandemiefolgen", from 27.06.2022). The welcome center of the University of Tübingen (<https://uni-tuebingen.de/en/9263>) professionally supported all our guests concerning non-academic and practical issues and will continue to do so for upcoming visits.

Guest Visits: Tessa Warren (28.07 - 08.08.2022); Nasrin Sedaghatgoftar (planned for February 2023); Yaffa Yeshurun (planned for March 2023), Roberto Bottini (planned for 26.-28.04.2023), Denise Stephan (planned for June 2023), James McClelland (planned for 11.-13.09.2023), Uta Noppeney (planned for summer 2023).

Mercator Fellow Visits: Arthur Glenberg: 10.09.2021 - 03.10.2021 (including retreat at Heiligkreuztal); 11.09.2022 - 07.10.2022 (including retreat at Obermarchtal). Diane Pecher: 14.09.2021 - 17.09.2021 (retreat at Heiligkreuztal), 09.01.2022 - 23.01.2022, 08.07.2022 - 23.07.2022, 21.09.2022 - 23.09.2022 (retreat at Obermarchtal).

Intramural grants

These grants aimed to provide researchers of the research unit with funds for promising innovative research projects that investigate the interactions and functions of modal and amodal representations but are not part of one of the funded proposals. In the first round of funding, we approved four projects with an allowance of overall € 11,800. The funding decisions were made by the steering committee, whereby all funded projects involved a collaboration between members of different projects, thus fostering scientific exchange within the research unit. Proposals from early-career researchers had the highest priority. The funding of projects by early-career researchers was supposed to promote their scientific development and provide an opportunity to conduct independent, smaller-scale research projects that would allow them to extend their work beyond the immediate scope of the individual projects of the research unit. Preliminary results of the research projects were presented in a poster session at the group retreat in Obermarchtal (Sep. 2022). Results will be summarized in written reports covering scientific and

¹As a deviation from the originally suggested list of Mercator fellows, due to personal and pandemic-related reasons, James McClelland could not accept the appointment as originally agreed upon. We have been able to replace this position with Arthur Glenberg, who is a designated expert on mental representations and embodied cognition.

budgetary aspects. The steering committee recently approved the second round of funding involving three projects with an overall funding amount of € 11,332.

First Round Projects: Carolin Dudschig (A4) / Nicoletta Simi (A4) / Mechteld van den Hoek Ostende (B2): The role of modal vs. amodal representation in children with ADHD during conflict-related negation processing; Carolin Dudschig (A4) / Markus Huff (Ass.) / Barbara Kaup (A6): Integration of multimodal information in narrative comprehension; Kathrin Reichmann (A3) / Mechteld van den Hoek Ostende (B2) / Ulrike Schwarz (B2): Representational mismatch: Can symbolic information change modal representations of food? Nicoletta Simi (A4) / Theodora Potamianou (B1) / Francesca Capuano (Ass.): Role of input format for reversal processes: Evidence from binary and non-binary negation in tasks with different degrees of modality.

Second Round Projects: Karin Bausenhardt (A6/C) / Markus Janczyk (A2/A4): Commonalities and differences of absolute identification and Garner interference? Barbara Kaup (A6) / Hong Yu Wong (Ass.) / Krisztina Orban (Ass.) / Rolf Ulrich (A6): Abstract vs. concrete concepts: Are abstract concepts more emotionally valenced than concrete concepts? Kathrin Reichmann (A3) / Mechteld van den Hoek Ostende (B2) / Ulrike Schwarz (B2): Do amodal stimuli differentially influence attitude change towards chocolate in cravers and non-cravers?

Modal and amodal cognition as a topic in teaching

The topic of modal and amodal cognition has also transcended into the BSc. and MSc. programs in Psychology and Cognitive Science of the University of Tübingen, enhancing the profile of these study programs by strengthening their research-oriented focus on cognition. In addition to the seminars and practical courses that directly took up the topics of the research unit in teaching, a large number of B.Sc. and M.Sc. theses (N= 44), devoted to topics related to the research unit, were successfully completed within or across the individual projects of the research unit.

- 2020/21, M.Sc. Psychologie, Forschungsseminar und Forschungspraktikum "Räumliche Repräsentationen als Basis für abstrakte Konzepte" (Barbara Kaup & Rolf Ulrich)
- WS 2020/21 M.Sc. Psychologie, Forschungsseminar und Forschungspraktikum "Experimentelle Psychopathologieforschung bei Essstörungen - Die Relevanz modaler und amodaler Repräsentationen beim Essverhalten" (Philipp Schröder & Jennifer Svaldi)
- SS 2021, B.Sc. Psychologie, Seminar "Modale und Amodale Kognition" (Barbara Kaup & Rolf Ulrich)
- WS 2022/23, B.Sc. Psychologie/ B.Sc. Psychologie polyvalent, Seminar Entwicklungspsychologie "A developmental perspective on embodiment" (Venera Gashaj)

Web 2.0 / Outreach / Science communication

We created a webpage (<https://uni-tuebingen.de/de/169941>) that describes the research unit's topics, composition, and structure. To support the buildup of a stable scientific network with national as well as international researchers and others interested in the format of cognitive representations, we have recently also set up a mailing list for external subscribers. Through this mailing list, we will regularly announce talks, activities, and events of the research unit in a newsletter-like format. This will further increase the research unit's national and international visibility and pave the way for the scientific community to join in and benefit from our scientific program.

In addition to our website and mailing lists, we have taken several other measures to make the research unit and its topic scientifically and publicly visible. For example, we have organized several conference symposia, including presentations from researchers from within and outside the research unit at national conferences such as TeaP and KogWis. Besides many national and international conference contributions from individual projects, more comprehensive overviews of scientific results and current debates regarding the format of cognitive representations were provided in external colloquia, keynote talks, and public lectures. As a joint effort from Projects C, A4, A6, and B1, we are currently developing a contribution for the science communication magazine *Frontiers for Young Minds*. In this article, we will cover the topic of cognitive representations and processing styles in problem-solving and the mechanisms underlying error-making and cognitive control, specifically tailored to an age group of 8-12-year-old children. Under the motto "Spielen für die Wissenschaft", members of our group have also introduced their work

related to developmental issues in cognitive representations to the public at the *Kindertag* of the *Stadtfest in Tübingen* (09 July 2022).

Symposia: *Modal and amodal cognition: Functions and interactions*. Symposium held at the Teap 2021. Organizers: K. M. Bausenhardt & B. Kaup. *The role of modal and amodal representations in cognitive functions*. Symposium held at the Teap 2022. Organizers: K. M. Bausenhardt & N. Simi. *Categorization and representation in perception, thinking, and action*. Symposium held at KogWis 2022. Organizers: K. M. Bausenhardt & K. Reichmann.

Keynote talks and public lectures: Bausenhardt, K. M. (2021). *Psychologische Einflussfaktoren auf die Wahrnehmung von Dauer, Reihenfolge und das Vergehen der Zeit: Ein Überblick*. Talk held at Fachschaftstagung Physik in Braunschweig. Bausenhardt, K. M. (2022). *Vom Empfinden, Vergehen und Denken über Zeit*. Public lecture given at the Institut für theatrale Zukunftsforschung, SITZung Zeitwahrnehmung. Kaup, B. & Ulrich, R. (2021). *Modal and amodal representations: An introduction and overview*. Talk held at Teap 2021. *The interplay of modal and amodal processes in language comprehension*. Talk held at Aachen University. Kaup, B. (2022). *The interplay of modal and amodal processes in language comprehension*. Keynote at A-Dok 2022, Bremen University.

Sharing of facilities / Technical and methodological expertise

The PIs have several lab facilities and technical and methodological expertise (EEG and analysis software, eye-tracking, mouse-tracking, high-precision motion tracking, transcranial direct current simulation (tDCS), virtual reality, computational modeling, and innovative statistical analyses). These facilities and expertise are shared in the research unit, particularly in collaborations between individual projects. This provides a significant gain for the research unit, which would not be achieved to the same degree via stand-alone projects. We also support initiatives for sharing methodological knowledge from central funds. For example, we have sponsored participation in an online experimenting workshop for three dedicated members of our group, who have in return agreed to serve a multiplier role for the whole research unit by covering parts of the “Workshop: (Online-)Experimenting with PsychoPy and jsPsych” mentioned above. Likewise, senior researchers, fellows, and guests of our group have offered talks, workshops, or discussion rounds to share knowledge and experiences in their specific areas of expertise and “meet-the-expert” discussion sessions in our PhD colloquium:

Sharing of expertise: Workshop on meta-analysis (Rolf Ulrich, see also above); Talk on registered reports and other preferable scientific practices (Volker Franz); “Meet the Expert” discussion sessions: Scientific writing style (Diane Pecher); Publication process and the editor’s role in it (Tessa Warren).

Methodology / Data handling / Open science

We followed the specifications made in the proposal for the current funding period concerning methodology and data handling. Specifically, similar standards regarding methodology and data handling were employed in all projects. All projects use established paradigms and methods of experimental psychology (e.g., Stroop-like conflict tasks, dual task manipulations, magnitude matching tasks, Garner interference tasks, and associative learning tasks). This approach was to be supplemented by eye tracking and electrophysiological measures, but this was possible to a very limited extent due to pandemic-related restrictions. Most projects that had planned to use these measures have postponed the respective studies to the current last year of the funding period (see individual proposals).

Regarding experimental methods, whenever possible, we used both within-subjects designs and sequential statistical procedures to achieve high statistical power for testing major theoretical hypotheses. We aimed at a statistical power of at least 80 % and used this value for calculating the sample size of our studies. If effect sizes could not be estimated from previous studies, we calculated sample size for medium effect sizes. Random factors (e.g., subjects and items) were included in the analysis using linear-mixed effect models (instead of using separate by-item and

by-subject ANOVAs). Bayesian procedures for testing null-hypotheses also supplemented these inferential statistical tools. We kept possible yet unavoidable Type 1 errors at a minimum by replicating results of major theoretical importance, following best statistical practices, and by taking particular care to avoid the problems that have been identified in recent years as being surprisingly prevalent even in well-established research.

The experiments conducted during the first funding phase were typically preregistered, and in those cases where results from the first funding phase are part of a publication, the collected data are typically made publicly available together with the experimental material and analysis scripts.

Finally, we devoted effort into developing, communicating and teaching about the Open Science Initiative (see e.g., Open science in teaching and established task force “Open Science”).

Preregistrations:

●A1: [doi: 10.17605/OSF.IO/W23GK](https://doi.org/10.17605/OSF.IO/W23GK) <https://osf.io/knzvy/> ●A2: <https://aspredicted.org/g8gu4.pdf>
https://aspredicted.org/5PH_67Q https://aspredicted.org/128_S2L https://aspredicted.org/YLL_WOC
<https://aspredicted.org/~zlynivgd9q> ●A3: https://osf.io/tafy9/?view_only=7003e08bd8c841db9c846eed216e1794
https://osf.io/ra3su/?view_only=eeae7f619db4ef68f0d6ea9fbc43881 ●A5: <https://osf.io/53f6x>
<https://osf.io/h7vpm> <https://osf.io/945uq> ●A6: [doi: 10.17605/OSF.IO/WH7RU](https://doi.org/10.17605/OSF.IO/WH7RU) [doi: 10.17605/OSF.IO/672DB](https://doi.org/10.17605/OSF.IO/672DB)
[doi: 10.17605/OSF.IO/8F5HB](https://doi.org/10.17605/OSF.IO/8F5HB) https://aspredicted.org/YWZ_K57 https://aspredicted.org/Y4X_5LN
https://aspredicted.org/4TD_VHD ●B1: [doi: 10.17605/OSF.IO/85HBT](https://doi.org/10.17605/OSF.IO/85HBT) [doi: 10.17605/OSF.IO/EZ7C6](https://doi.org/10.17605/OSF.IO/EZ7C6) [doi: 10.17605/OSF.IO/PMHQQ](https://doi.org/10.17605/OSF.IO/PMHQQ)
[doi: 10.17605/OSF.IO/573G](https://doi.org/10.17605/OSF.IO/573G) [doi: 10.17605/OSF.IO/J4QYP](https://doi.org/10.17605/OSF.IO/J4QYP) ●B2 [doi: 10.17605/OSF.IO/8XQ4V](https://doi.org/10.17605/OSF.IO/8XQ4V) [doi: 10.17605/OSF.IO/VK7HE](https://doi.org/10.17605/OSF.IO/VK7HE) https://aspredicted.org/FQ9_6CR.

Publicly available data, scripts and experiments:

●A2: <https://osf.io/z3qc4/> <https://osf.io/ent2y/>
●A3: https://osf.io/tafy9/?view_only=7003e08bd8c841db9c846eed216e1794
https://osf.io/ra3su/?view_only=eeae7f619db4ef68f0d6ea9fbc43881 ●A5: <https://osf.io/u9wer/> ●B1 [doi: 10.17605/OSF.IO/FYQ52](https://doi.org/10.17605/OSF.IO/FYQ52) [doi: 10.17605/OSF.IO/F48QP](https://doi.org/10.17605/OSF.IO/F48QP) [doi: 10.17605/OSF.IO/4DEAM](https://doi.org/10.17605/OSF.IO/4DEAM) [doi: 10.17605/OSF.IO/M4J3E](https://doi.org/10.17605/OSF.IO/M4J3E)

Open science in teaching and beyond

- Invited talk “Open Science” by Krzysztof Cipora, Loughborough University, and best-practice discussion at Virtual Retreat (18.06.2021)
- WS 2021/22, MSc. Psychologie, Forschungsseminar und Forschungspraktikum "Replizierbarkeit und Open Science" (Hans-Christoph Nürk)
- SS 2022, Workshop targeted at early-career researchers “Promoting transparency and replicability in research” (organizing committee: Jessica Steil, B1, and Lili Roth, B5, among others).

Equality measures

FOR 2718 is highly dedicated to promoting gender equality in science and increasing the number of women in academia. We have developed an active policy supporting equal opportunities for women in science, especially in the early career stages. Specifically, we have aimed for a substantial proportion of female researchers in the composition of the research units, its committees and for the open positions in our research unit (see table below). Seven out of 16 PIs (44 %) in the first funding period were women, two of them in the early stages of their scientific career (mean age 44 years; mean age of all PIs 51.6 years). Notably, 6 out of 8 members of the steering committee of the first funding period were female (5 of them female scientists in the early career stages), and the gender ratio of the advisory board members was equal. In addition, we have recruited an especially large proportion of female graduate-level and postdoctoral researchers among our scientific staff (12 out of 15, 80 %). We actively support female researchers within the research unit during their employment with several equal opportunity measures. These measures focus on career development and on fostering the compatibility of scientific and care work. All taken measures were guided by the funding rules of the German Research Foundation, and include, for example, financial support for soft-skill and professional development courses for female researchers, support for childcare during holidays and during scientific events, as well as the financing of student assistants for female researchers with family

responsibilities (etc.). For instance, student assistants were funded for Dr. Carolin Dudschig and for Dr. Donna Bryce, both early-career researchers with two young children, to relieve them from routine tasks in their work and to assist in their professional duties, especially outside of regular childcare hours. To further support the compatibility of scientific and care work, we ensure that all colloquia and meetings take place during regular hours of childcare, and we take school holidays etc. into consideration when scheduling workshops and retreats. Especially during and since the pandemic, compatibility of scientific and care work has been extremely complicated due to school and daycare lockdowns but also ongoing restrictions in opening hours of individual daycare facilities. Whenever possible, we thus offer the opportunity to join research group events planned as in-person meetings in a hybrid format. To ease active participation in and contribution to group meetings and discussions, we recently upgraded our equipment for hybrid meetings with a portable sophisticated tool for videoconferencing (*Meeting Owl 3, OWL labs*) to allow researchers to participate effectively in these meetings online even on short notice. We are currently also planning a lecture series in which we aim to invite accomplished female researchers to talk about their career paths as women in academia. Each lecture will be followed by a discussion round, with the goal to share experiences, advice, opportunities and discuss various topics related to equal opportunities in science.

Proportion/number of female researchers in different functions, first funding phase:

Career stage	N female	N male	% female
PIs (professorship level)	5	8	38
PIs (postdoctoral level)	2	1	66
Scientific staff (postdoctoral level)	4	1	80
Scientific staff (graduate level)	8	2	80
Steering Committee	6	2	75
Advisory Board	3	3	50
Mercator Fellows	1	1	50
External Speakers	8	18	31
Guests	2	1	66
Associated Members	8	9	47

Diversity

Not only gender equality but also other diversity-related aspects are crucial for promoting fairness and equal opportunities for researchers. In this regard we completely agree with and adhere to the German Research Foundation's newly developed policy of integrating equality- and diversity-oriented measures. We are committed to the view that academically irrelevant factors (e.g., gender, social and cultural origin, religion, age, state of health) should not cause disadvantages in career development, and that – on the contrary – diversity in project composition regarding such aspects will enhance our scientific agenda by promoting creativity and inclusivity with respect to research topics, methods and target groups. When hiring the scientific staff for our research unit we tried to make sure that the best qualified researchers were selected without any biases towards or against particular groups of people and with keeping in mind the composition and diversity of the group in total. As a result, we recruited scientists from various countries as Germany, Italy, Greece, Netherlands, Sweden, and India for post-doctoral and graduate positions (33% international), and thus have composed a diverse, international, and culturally rich working environment. All written and verbal communication within the workgroup is taking place in English, to promote inclusivity and enable barrier-free participation in all meetings and group activities for all researchers independent of their cultural background (based on information in the course *Leading Diverse Teams*, <https://www.working-between-cultures.com>; multiplier: Donna

Bryce). Moreover, while our central research question regarding the format of cognitive representations is a fundamental issue in general cognitive psychology, we address this question also with respect to developmental issues across the lifespan (B1) as well as psychological dysfunction (B2), thereby increasing applicability and extending the scope of our research towards a wide range within the population. In addition, B2 will consider gender and sexual orientation as relevant categories in all experiments. These factors have not received sufficient attention in previous research although they strongly affect the prevalence of eating disorders. In the long run, a better understanding of how these social categories relate to the development and maintenance of eating disorders might help to improve the efficacy of treatment and prevention programs.

Early career support / Mentoring programme / Milestone questionnaires

Our research unit involves many researchers in early and mid-career stages: within the first funding period, 10 graduate students and 5 post-doctoral researchers have been hired as scientific staff. In addition, three highly qualified mid-career scientists (Donna Bryce, Carolin Dudschig, Markus Janczyk) proposed their own research projects in the first funding phase as principal investigators. Supporting and promoting these early- and mid-career scientists in their academic development has been defined as one of the core objectives of the research unit. These objectives were addressed through various measures and activities, from within the research unit, as well as through institutionalized programs at the University of Tübingen.

In itself, the research unit provides an especially fruitful and rich environment for graduate and postdoctoral students to develop their professional skills and to pursue their research interests surrounding the topic of cognitive representations. Since all projects are comprised of principal investigators from different subdisciplines of psychology or other fields within the cognitive sciences, early-career researchers encounter a broad range of general and applied aspects of the research unit's overarching topics, as well as gain experience with a variety of research methods, paradigms, and theoretical approaches. This is further structurally supported by the above-mentioned intramural grants with their funding priority for collaborative projects proposed by early-career researchers. Graduate students and postdocs of the research unit also receive ample opportunity to develop their academic skill set and build up a professional network by participating in activities exceeding the specific work in the individual projects. For example, graduate students of the research unit have organized their own yearly retreat and developed its scientific programme, have set up a weekly writing club, and they participated in the steering board and task forces of the research unit. Extending the immediate scope of the research unit, our graduate students and post-doctoral researchers have also contributed to the scientific community, for example by co-organizing scientific events as the *ADOC* (*Lea Eichfelder, A2*), co-hosting conference symposia (*Kathrin Reichmann, A3, Nicoletta Simi, A4, Karin Bausenhardt, A6*), and a workshop on Open Science Practices (*Jessica Steil, B1; Lili Roth, associated member*) and gathered teaching experience by hosting seminars or co-supervising BSc. and MSc. theses (*Kathrin Reichmann, A3, Julia Huber, A5, Ulrike Schwarz, B2, Karin Bausenhardt, A6*).

As mentioned above, a dedicated task force was created to develop a structured approach to guide and support graduate students throughout their pre-doctorate career phase on an individual level. A specifically designed milestone questionnaire (see Section 6 for the exact wording) is used to structure the assessment not only of scientific achievements and the current status of the doctoral projects, but also further aspects such as the personal development of professional skills and abilities, goals and potential career paths. Personal progress and goal achievement is monitored and evaluated throughout the doctorate phase in these discussions. Moreover, all graduate students are encouraged to select a mentor among the PIs or associated

members of the research unit, who is not part of the specific research project in which the graduate students are employed. The completed milestone questionnaires and other relevant aspects are then discussed by the graduate student and the mentor in separate meetings. Thereby, the mentor acts as an advisor and can offer an independent perspective on the growth and development of the graduate student.

Moreover, each graduate student has the opportunity to develop their presentation skills and discuss their scientific results, but also obstacles, open questions or methodological issues either within the setting of the PhD student colloquium or to the larger audience of our weekly research unit colloquium. By the end of the first funding period, each graduate student will have presented their work in this latter format at least once.

The internally organized measures to promote early-career researchers are complemented by a variety of services and support for researchers at the University of Tübingen, as for example, the research support regarding funding schemes, applications and stipends offered by the Division of Research, research funding news and post-doctoral newsletters, the university-wide intramural funding program for innovation grants, transfer projects, networking events or support for the completion of third-party funding proposals. Finally, the Graduate Academy offers consultation, training, workshops, and various information services to support the individual and professional development of early- and mid-career researchers. This has been especially well-received by our graduate and postdoctoral staff.

In sum, these measures have helped the excellent junior and mid-level scientists of our research unit to accomplish a number of scientific achievements: Even though data collection in many of the individual research projects was severely impeded during the pandemic, to date 12 research articles first-authored by our scientific staff have been published or pre-published, and we expect two doctoral theses to be submitted in spring 2023. Moreover, several of the mid-career principal investigators have successfully advanced their scientific career and / or several of the non-tenured PIs have been promoted to permanent positions during the first funding phase of the research unit: Markus Janczyk is now tenured as a professor for research methods and cognitive psychology at the University Bremen; Carolin Dudschig was awarded a Heisenberg fellowship by the DFG and got tenured at the department of Psychology in Tübingen; Michael Ramscar was also tenured at the department of Psychology in Tübingen. Finally, Donna Bryce recently accepted a tenured position as *Akademische Rätin* at an German university.

Joint office space for the research group

The research unit is characterized by a high spatial proximity among the participating projects. To further support this outstanding feature, a joint office space for the research group was set up by the University of Tübingen for the time of funding, situated in a building immediately neighboring the Department of Psychology main building. This dedicated space includes workstations and office equipment for all doctoral students and postdoctoral researchers, scientific coordination, as well as flexible office space and workstations for visiting researchers and Mercator fellows. This ensures that the scientific staff of the research unit can fully exploit the cooperation potential between the projects, attain a high level of cohesion, and benefit from synergistic effects between the individual projects' work. All the equipment (office furniture and technology) was selected to allow a high degree of flexibility in working so that it is for example also possible to work from home or in the context of the working groups of individual projects located in neighboring buildings by taking advantage of portable hardware and cloud-based software solutions.

Joint office space of the research unit.



On an institutional level, the university of Tübingen successfully participates in the Human Resources Strategy for Researchers (HRS4R) audit. Its excellent working environment and outstanding development and qualification opportunities have been confirmed by the “HR Excellence Research” quality seal.

Staff:

Karin Bausenhart, 10/2020 – 09/2023 (TV-L E13; Postdoc 50%)