



# International Workshop on Modal and Amodal Cognition

**Date:** 15.05.2024 – 17.05.2024

**Location:** Universität Tübingen, Alte Aula, Münzgasse 30, 72070 Tübingen

This workshop will bring together international experts from psychology and related disciplines, to explore and discuss issues related to the format of mental representations, with a particular focus on the role of modal and amodal representations in various fields of human cognition (including perception, learning, thinking, motor processing, emotion, etc.).

We are convinced that this workshop will provide a great chance to network with fellow international researchers and establish collaborations within the field while enjoying the charms of Tübingen, which is known for its picturesque old town, historic university, and scenic setting along the Neckar River.

## Organizers

Karin Bausenhardt

Barbara Kaup

Rolf Ulrich



## Acknowledgements

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This workshop is funded by the Deutsche Forschungsgemeinschaft (DFG – German research Foundation) – 381713393, within the Research Unit FOR2718: Modal and Amodal Cognition.

The German Research Foundation is a major research funding organization in Germany, responsible for promoting and supporting academic research and scientific cooperation across various disciplines. Its primary goal is to fund and facilitate high-quality research projects, promote the training of young researchers, and foster international collaboration in science and academia. It plays a crucial role in shaping the research landscape in Germany and promoting scientific excellence both nationally and internationally.

Further information about the German Research Foundation can be found here:  
<https://www.dfg.de/en>

### WIFI

Participants and speakers can use their eduroam login to access the wifi provided by the University of Tübingen. Participants and speakers who do not have their own eduroam login can use the following login:

SSID:	Guest
User name:	siakbg01
Password:	jn5jn1

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## Conference venue

### **All talks and the poster session will take place in the Alte Aula:**

Universität Tübingen, Alte Aula, Münzgasse 30, 72070 Tübingen, (A) in following map

*Public transport:* The Alte Aula is centrally located in the city of Tübingen and can best be reached by with a short walk from Hauptbahnhof (8 minutes) or either bus stops “Neckarbrücke” (4 minutes) or “Am Stadtgraben” (7 Minutes)

### **Networking events**

Please note that registration for these events is closed due to capacity limitations. If places become available at short notice, interested guests can register at the conference help desk.

### **Warming up (invited speakers, May 14<sup>th</sup>, 2024):**

Restaurant “Mauganeschtle” Burgsteige 18, 72070 Tübingen, see (B) in following map

### **Get-together at the Guest House of University of Tübingen (May 15<sup>th</sup>, 2024):**

University of Tübingen, Guest House, Lessingweg 3, 72076 Tübingen

### **Punting boat trip (May 16<sup>th</sup>, 2024)**

Landing dock at Hölderlinturm, Bursagasse 6, 72070 Tübingen, (C) in following map

## Accomodation

### **Hotel am Schloss, Burgsteige 18, 72072 Tübingen**

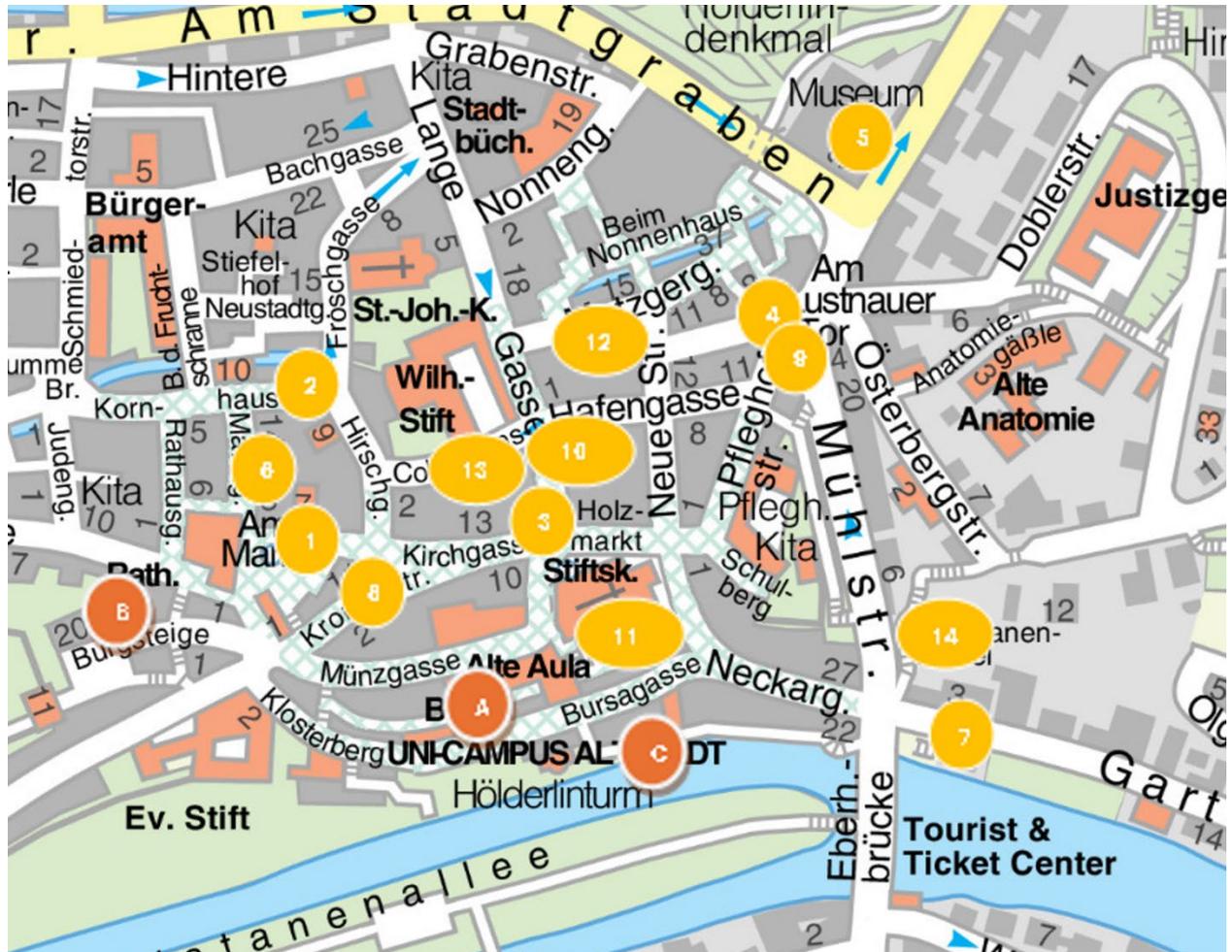
*Public transport:* The Hotel am Schloss is centrally located in the city of Tübingen and can best be reached by with a short walk from Hauptbahnhof (12 minutes) or either bus stops “Neckarbrücke” (8 minutes) or “Am Stadtgraben” (8 Minutes)

### **University of Tübingen, Guest House, Lessingweg 3, 72076 Tübingen**

*Public transport:* The guest house can easily be reached by bus lines 3 or 4, nearest bus stop “Im Rotbad”. By foot, it is a walk about 20 -25 minutes from the conference venue.

## Food

Tübingen's city centre offers many places to eat; cafés, restaurants, snack bars and takeaways. Here is a short list (not exhaustive) of some nearby places for your lunch breaks and evenings:



<https://www.tuebingen.de/stadtplan/>

## **Bistro & Bar**

**(1) Ranitzky:** coffee & bistro, Am Markt, 72070 Tübingen

**(2) Vegi:** vegan and vegetarian, oriental, Kornhausstraße 1, 72070 Tübingen

## **Bakery**

**(3) Hofpfisterei:** Aam Holzmarkt 2, 72070 Tübingen

**(4) Bäckerei Gehr:** Am Lustnauer Tor 5, 72074 Tübingen

## **Restaurants**

**(5) 1821 Tübingen:** regional & international dishes, Wilhelmstraße 3, 72074 Tübingen

**(6) Alte Kunst:** italian dishes, Marktgasse 8, 72070 Tübingen

**(7) Neckarmüller:** regional dishes, Gartenstraße 4, 72074 Tübingen

**(8) Forelle:** regional & international dishes, Kronenstraße 8, 72070 Tübingen

**(9) Wurstküche:** regional dishes, Am Lustnauer Tor 8, 72074 Tübingen

**(10) Stern:** italian & international dishes, Lange Gasse 4, 72070 Tübingen

**(11) Al Dente:** italian dishes, Bursagasse, 72070 Tübingen

## **Take away**

**(12) Kichererbse:** oriental food, Metzgergasse 2, 72070 Tübingen

**(13) Hao's Box:** asian food, Lange Gasse 1, 72070 Tübingen

**(14) Brothers Orientfood:** oriental food, Gartenstraße 1, 72074 Tübingen

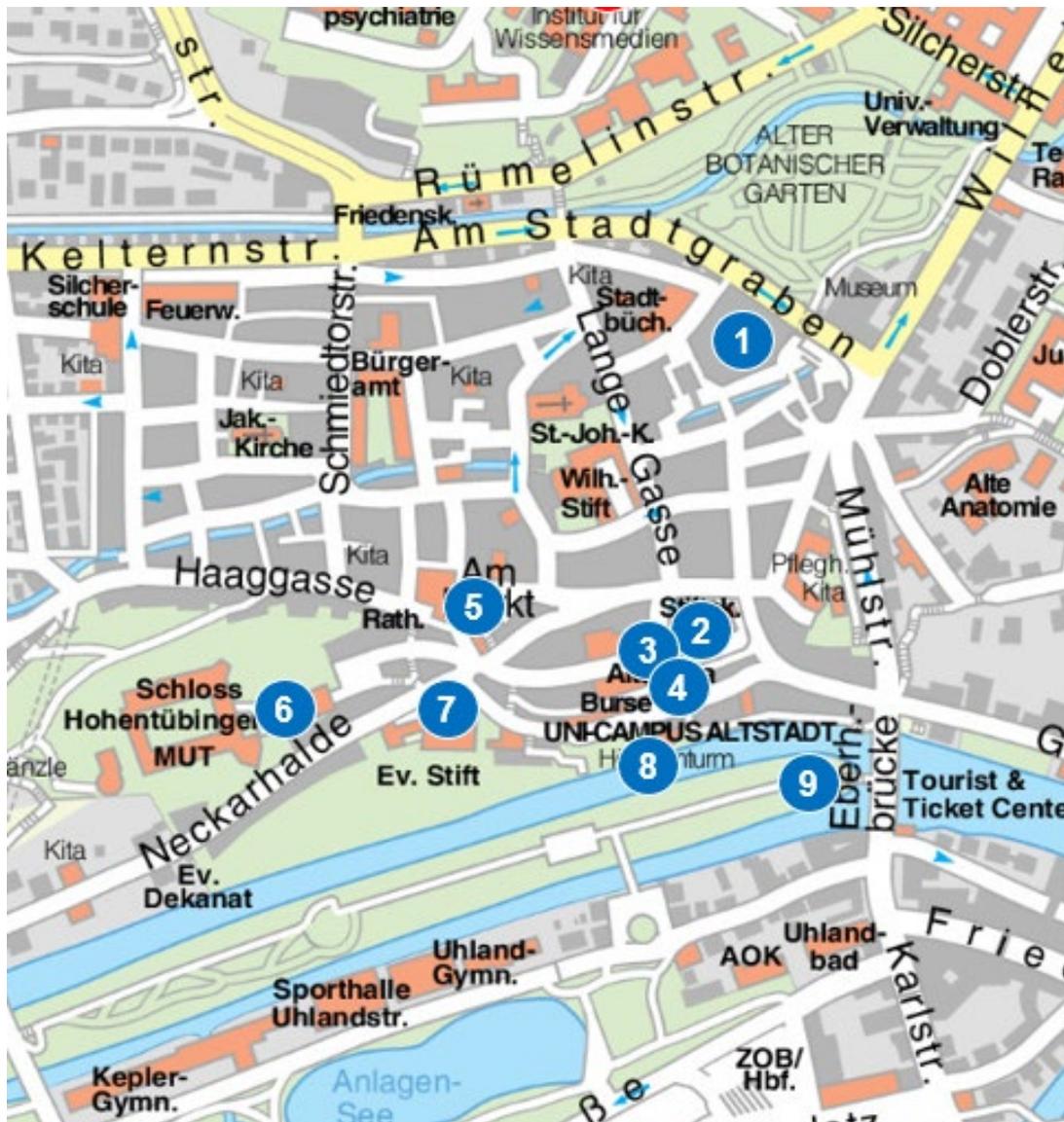
## About Tübingen

Small steps, narrow alleys, and pointed gables shape the silhouette of old Tübingen on the way up to its castle. The Swabian university town, with 28,000 of its 90,000 inhabitants being students, combines the flair of a lovingly restored medieval town center with the colorful bustle and typical atmosphere of a young and cosmopolitan students' town. Tübingen has witnessed almost a millennium of history. The area was likely first settled in the 12th millennium BC; Tübingen itself dates to the 6th or 7th century AD. It was first mentioned in writing in 1078 and achieved town status and civil liberty under the Palatine Counts of Tübingen in the middle of the 13th century.

Many well-known personalities have resided in Tübingen over the past few centuries. They came to teach, to study, or to find space for their artistic, scientific, or political goals. The University became the cornerstone for numerous great careers and has itself been molded and enriched by the subsequent activities and events.

Discover the treasures of the historic old town: The Protestant seminary, in which Hölderlin, Schelling, and Hegel once shared a study; or the town hall in the marketplace, which is more than 500 years old. The Hölderlin Tower by the Neckar River invites you to linger with a line of "Stocherkähne," punting boats unique to Tübingen ready for a ride. Numerous sidewalk cafes, wine taverns, restaurants, and boutiques invite visitors to stroll around and to pause here and there.

**Sightseeing walk through Tübingen** (Numbers refer to the map below)



<https://www.tuebingen.de/stadtplan/>

**House of the Nuns (Nonnenhaus) (1)**

The House of the Nuns dates back to the second half of the 15th century and owes its name to the Beguine or hermit women who lived here in a fellowship similar to nuns and who devoted their lives to charity. The stairs on the exterior of the building lead to the second floor, and to the left you will see to the so-called Speaking House, a medieval toilet directly over the Ammer Canal. Leonhard Fuchs, professor of medicine in Tübingen and known as the Father of Botany, moved into the house in 1535 and planted an herb garden next to the building, which he used for his

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experiments on the medicinal use of plants. In the 18th century, a newly discovered plant family, Fuchsia, was named after him. The stone book in front of the House of the Nuns commemorates his work.

### **Collegiate Church (Stiftskirche) (2)**

In the context of the foundation of the University in 1477, the former parish church, which was mentioned for the first time in 1191, was transformed into a Gothic Collegiate Church. It was one of the first churches to convert to Martin Luther's protestant church after the Reformation in 1534. The top of the tower was added only at the end of the 16th century. As one of the most important churches in Württemberg – and thanks to the support of Duke Eberhard im Bart (the Bearded) of Württemberg – the Collegiate Church received an excellent décor.

### **Goethe (3)**

Across from the Stiftskirche (Collegiate Church), number 15 in the Münzgasse lane, you will find the Cotta-Haus (House of Cotta), the former address of the famous publishing house that released the works of Schiller and Goethe. A plaque on the Cotta-Haus commemorates Goethe's stay of a few weeks while visiting his publisher (Hier wohnte Goethe). This is parodied on the building next door – once a dormitory, which features a plain sign with the words Hier kotzte Goethe (“Goethe puked here”).

### **Burse (4)**

The Burse was built from 1478 to 1482 as a students' home and study shortly after the founding of the University. From 1803 to 1805, the building was transformed into the first medical clinic in Tübingen. One of the first patients was the poet Friedrich Hölderlin, who was released as incurable after 231 days of therapy in 1807. With the advancing medical development, the clinical center became too small. In 1972 – after a thorough reconstruction of the building – students and professors of philosophy and art history returned to this place of the “free arts”.

### **Marketplace (Marktplatz) and City Hall (Rathaus) (5)**

The Market Square with the City Hall and Neptune's Fountain, along with the Neckar waterfront, is one of Tübingen's favorite photography locations. The visually dominating City Hall – the oldest house at the marketplace – was built with three stories in 1435, in 1508 heightened by a fourth level, and in 1511 decorated with an artfully made astronomical clock by Johannes Stöffler. The clock, which is still functioning, shows the course of the stars, the phases of the moon, and even such celestial events as eclipses of the sun and the moon. The Renaissance Neptune's fountain gives a certain touch to the marketplace and dates back to the beginning of the 17th century. It is the work of the master builder Georg Müller based on the design by Heinrich Schickard, who was inspired by a Bolognese archetype.

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### **Hohentübingen Castle (Schloss Hohentübingen) (6)**

In 1078, the castle of the Counts of Tübingen was mentioned for the first time. The current castle, which hosts numerous institutes and collections of the University, derives mainly from the 16th century. The Hohentübingen Castle is a mighty renaissance construction with four wings and a round tower. Its most beautiful decoration is the Renaissance portal built around 1606 in the style of a Roman triumphal arch, whose center shows the emblem of the Duchy of Württemberg. Beginning in the mid-18th century, the University acquired its first rooms in the castle, and in 1816, the King of Württemberg, Wilhelm I, transferred ownership of the castle to the University. The University library of nearly 60,000 volumes was temporarily housed in the hall of knights, an astronomical observatory was housed in the northeast tower, and a chemistry laboratory was set up in the kitchen. There, in 1869, Miescher was the first researcher to isolate various phosphate-rich chemicals (nucleic acid) in a laboratory, paving the way for the identification of DNA as the carrier of inheritance. After the complex restoration of the castle from 1979 to 1994, some of the University's cultural and academic institutions were relocated there, the collections of which are open to the public. Parts of the highlights are numerous archeological findings and replicas, such as a complete ancient Egyptian burial chamber. From the castle, the visitor has views to the city, as well as to the Neckar and Ammer valleys and the extended region up to the horizon of the Swabian Alb in the south.

### **Protestant Collegiate (Evangelisches Stift) (7)**

The Evangelisches Stift was a former monastery of the Augustinians. In 1534, after the implementation of the reformation in Württemberg, it was reconstructed and enlarged in order to serve as a ducal stipend, a scholarship for students of Protestant Theology. A great amount of European intellectual history has been written within its walls. Among the scholars who studied there were Johannes Kepler, Gustav Schwab, Eduard Mörike, and Hermann Kurz as well as Georg Wilhelm Friedrich Hegel, Friedrich Hölderlin, and Friedrich Schelling, who occasionally lived and studied together in the collegiate at the end of the 18th century. Today it serves as an accommodation and study space for about 140 students. Women have been admitted since 1969.

### **Hölderlin Tower (Hölderlinturm) (8)**

In the late 18th century, the Hölderlinturm was built on the pedestal of the inner ring wall. The wall dates back to the 13th century. The poet Friedrich Hölderlin (born in 1770) lived here from 1807 until his death in 1843. The family of a carpenter, Zimmer, accommodated him in this building for the last 36 years of his life as he struggled with mental instability. Today, the Hölderlinturm is a literary memorial place and museum.

**Eberhards Bridge (Eberhardsbrücke), Neckar Island (Neckarinsel), Plane Tree Avenue (Platanenallee) (9)**

In central Tübingen, the Neckar River divides briefly into two streams, forming the elongated Neckarinsel, famous for its Platanenallee with high plane trees, some of which are more than 200 years old. During the summer, the Neckarinsel is occasionally the venue for concerts, plays, and literary readings. The row of historical houses across one side of the Neckarinsel is called the Neckarfront. Houses were built even upon the city wall above the Neckar River during the Middle Ages, which created this distinctive waterfront, including the Hölderlinturm. The Eberhardsbrücke, which was formerly the only bridge in the city center and is therefore also called Neckarbrücke, is dominated by pedestrians. The railings and lanterns are decorated with brightly blossoming flower baskets during the summer months.

To learn more about what Tübingen has to offer, please visit [www.tuebingen.de/en](http://www.tuebingen.de/en).

## University of Tübingen

“Tübingen does not have a university, it is a university,” is a common expression and for good reason: With its palm tree symbol and Duke Eberhard’s motto “Attempto!” (“Dare!”), the university and its 28,000 students certainly shape the city image. Its over 500 professors and nearly 5,000 academics make it the second largest university in Baden-Württemberg, following Heidelberg. Its seven institutes are spread throughout the city. In the old town, there is hardly a single building or location not associated with a famous scholar – Hegel, Hölderlin and Schelling, Mörike and Uhland, Kepler and Schickard among them. Furthermore, nine Nobel laureates are associated with the University of Tübingen.

The University of Tübingen is one of Europe’s oldest universities. Several hundred years of history in the sciences and humanities have been written here. The University’s history began back in 1477, when Count Eberhard “the Bearded” of Württemberg founded the University. The latest chapter of the University’s history is marked by its success in the Excellence Initiative of the German federal and state governments. One Graduate School, one Excellence Cluster, and the University’s Institutional Strategy were successful in the major funding program – also making Tübingen one of Germany’s eleven universities in the top “Excellent” class. The University has partnerships with more than 150 educational institutions in 45 countries, particularly in North America, Asia, and Latin America as well as with all countries in Europe. Moreover, together with 6 partner institutions, the University of Tübingen promotes excellence in research-led education within the Matariki Network of Universities (MNU). Some 13 percent of students in Tübingen come from abroad, and many of the University’s German students pursue part of their studies in other countries.

To learn more about the University of Tübingen, please visit the University’s Website: [www.uni-tuebingen.de/en](http://www.uni-tuebingen.de/en).

## Programme overview

### Tuesday, May 14<sup>th</sup>, 2024

6:30 pm	<b>Warming up, Restaurant “Mauganeschtle”</b> Burgsteige 18, 72070 Tübingen	
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### Wednesday, May 15<sup>th</sup>, 2024

<b>09:15 am – 10:30 am</b>	<b>Talk Session 1</b>	
9:15 am – 9:30 am	<i>Welcome</i>	
9:30 am – 10:30 am	<i>Modal and amodal cognition: An overarching principle</i>	Barbara Kaup, Rolf Ulrich, Robert Johansson, Karin Bausenhart, & Mandy Hütter
<b>10:30 am – 11:00 am</b>	<b>Coffee and Exchange</b>	
<b>11:00 am – 12:30 pm</b>	<b>Talk Session 2: Perception</b>	Chair: Jürgen Heller
11:00 am- 11:30 am	<i>Perception is modal iconic, non-propositional and non-conceptual whereas cognition is amodal, discursive and conceptual</i>	<u>Ned Block</u> , New York University
11:30 am - 12:00 pm	<i>The role of object structure in representational updating</i>	<u>Cathleen Moore</u> & Elisabeth Hein, University of Iowa
12:00 pm – 12:30 pm	<i>Head-shape invariant representation of dynamic facial expressions</i>	<u>Martin A. Giese</u> , University Clinic Tübingen
<b>12:30 pm – 2:00 pm</b>	<b>Lunch break</b>	

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<b>2:00 pm – 3:30 pm</b>	<b>Poster Session and Coffee</b>	
<b>3:30 pm – 5:00 pm</b>	<b>Talk Session 3: Memory &amp; Knowledge</b>	Chair: Kriti Bhatia
3:30 pm – 4:00 pm	Systems memory consolidation - from modal to amodal?	<u>Monika Schönauer</u> , University of Freiburg
4:00 pm – 4:30 pm	<i>Does multisensory integration benefit memory?</i>	<u>Diane Pecher</u> , Brandon Keytel, & René Zeelenberg, Erasmus University Rotterdam
4:30 pm – 5:00 pm	<i>Investigating the representational format of knowledge: Evidences and insights</i>	<u>Elisa Scerrati</u> , Catholic University of the Sacred Heart Milan
<b>6:30 pm – 10:00 pm</b>	<b>Get-together at the Guest House of University of Tübingen</b> Lessingweg 3, 72076 Tübingen	

## Thursday, May 16<sup>th</sup>, 2024

<b>09:00 am – 10:30 am</b>	<b>Talk Session 4: Language</b>	Chair: Markus Janczyk
9:00 am – 9:30 am	<i>The myth of the modal manifestation</i>	<u>Ulrich Ansorge</u> <sup>1</sup> & <u>Soonja Choi</u> <sup>2</sup> <sup>1</sup> University of Vienna <sup>2</sup> San Diego State University
9:30 am – 10:00 am	<i>Modal and amodal meaning components in language production</i>	<u>Rasha Abdel Rahman</u> , HU Berlin
10:00 am – 10:30 am	<i>Mental simulation in non-native speakers during language comprehension</i>	<u>René Zeelenberg</u> & <u>Diane Pecher</u> Erasmus University Rotterdam
<b>10:30 am – 11:00 am</b>	<b>Coffee and Exchange</b>	

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<b>11:00 am – 12:30 pm</b>	<b>Talk Session 5: Adaptation &amp; Control</b>	Chair: David Dignath
11:00 am – 11:30 am	<i>Modality effects in cognitive control: Evidence from task switching</i>	<u>Iring Koch</u> , RWTH Aachen
11:30 am – 12:00 am	<i>First the bones then the flesh: Toward a goal-directed explanation of maladaptive behavior</i>	<u>Agnes Moors</u> , KU Leuven
12:00 am – 12:30 am	<i>Episodic representations can be both modal and amodal and support flexible relational responding</i>	<u>Jan De Houwer</u> , Ghent University
<b>12:30 pm – 2:00 pm</b>	<b>Lunch Break</b>	
<b>2:00 pm – 3:30 pm</b>	<b>Talk Session 6: Perception &amp; Action</b>	Chair: Volker Franz
2:00 pm – 2:30 pm	<i>Predictions and perception in the human brain - in Gestalt, colour, and magic</i>	<u>Andreas Bartels</u> , University of Tübingen
2:30 pm – 3:00 pm	<i>Thoughts about actions and outcomes (and what they lead to)</i>	<u>Ruud Custers</u> , Utrecht University
3:00 pm – 3:30 pm	<i>On the relationship between features of an action plan in working memory and the speeded naming of tools/utensils: New empirical evidence and a theoretical framework</i>	<u>Daniel Bub</u> , University of Victoria
<b>3:30 pm – 4:00 pm</b>	<b>Coffee and Exchange</b>	
<b>4:00 pm – 5:00 pm</b>	<b>Panel Discussion</b> <i>Panelists: Monika Schönauer, Diane Pecher, Martin Fischer, Hanspeter Mallot</i>	Host: HC Nuerk
<b>5:30</b>	<b>Networking on the Neckar: Punting Boat Trip</b>	

## Friday, May 17<sup>th</sup>, 2024

<b>09:00 am - 10:30 am</b>	<b>Talk Session 7: Numeric Cognition</b>	Chair: Martin Butz
9:00 am – 9:30 am	<i>Developmental dynamics between innate and acquired representation: The case of numerical cognition</i>	<u>Daniel Ansari</u> , Western University Ontario
9:30 am – 10:00 am	<i>Representation and process in embodied cognition: The case of number concepts</i>	<u>Martin H. Fischer</u> , University of Potsdam
<b>10:00 am – 10:30 am</b>	<b>Coffee and Exchange</b>	
<b>10:30 am – 12:00 pm</b>	<b>Talk Session 8: Language &amp; Thinking</b>	Chair: Claudia Friedrich
10:30 am – 11:00 am	<i>In and out of sight: Processing concepts in situated and displaced contexts</i>	Viktor Kewenig, Jeremy Skipper, & <u>Gabriella Vigliocco</u> , University College London
11:00 am – 11:30 am	<i>Grounding of concrete and abstract concepts in modal experiential brain systems related to perception, action, and introspection</i>	<u>Markus Kiefer</u> , University of Ulm
11:30 am – 12:00 am	<i>The format of representations of the abstract relations same and different in prelinguistic thought</i>	<u>Susan Carey</u> , Harvard University
<b>12:30 pm</b>	<b>Farewell</b>	Rolf Ulrich

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## **Invited talks**

**(authors in alphabetical order)**

## Invited talk

### Modal and amodal meaning components in language production

Rasha Abdel Rahman & Marisha Herb

Humboldt University Berlin, Berlin, Germany

During verbal communication sensations and bodily experiences are frequent topics of conversation. However, in contrast to well-investigated semantic factors, little is known about whether and how lexical selection is influenced by sensorimotor experiences. Experimental findings demonstrate that sensorimotor experiential activations guide language production and may directly be reflected in the words we choose when we speak. Here, with a mega-analytic approach, we analyzed the data from 15 language production experiments showing that the categorical-semantic similarity between concepts slows down object naming, an often replicated interference effect taken to reflect the co-activation and competition of lexical-semantic alternatives for selection. Taking the grounding of concepts in multimodal experiences into account, sensorimotor strength (Lynott et al., 2020) facilitates naming and reduces categorical-semantic interference, whereas sensorimotor similarity (Wingfield & Connell, 2023) enhances semantic-categorical interference. These findings underscore the role of experiential traces and their interplay with classic semantic relations during language production.

**Keywords:** *Speaking, semantic interference, sensorimotor similarity, sensorimotor strength*

## Invited talk

### **Developmental dynamics between innate and acquired representation: The case of numerical cognition**

Daniel Ansari

Western University Ontario, London, Canada

Humans are born with a basic sense of numerical quantity that they share with other species, such as being able to discriminate which of two quantities of food is numerically larger (referred to as non-symbolic number processing). However, unlike non-human animals, humans have invented symbolic representations of numbers (e.g. Arabic numerals). In this talk I will consider how symbolic and non-symbolic representation of number are related to one another. I will draw on longitudinal, neuroimaging and cross-cultural research to explore this interplay between innate (non-symbolic) and acquired (symbolic) representations. Nativist accounts have posited that symbolic representations acquire their meaning by being mapped onto their non-symbolic counterparts. Contrary to this theory, I will present evidence which demonstrate that symbolic representations influence non-symbolic representations, rather than vice-a-versa. Furthermore, I will explore how symbolic and non-symbolic numerical quantities are represented in the brain.

**Keywords:** *Numerical cognition, developmental dynamics, symbolic representations, non-symbolic representations, symbol-grounding*

## Invited talk

### The myth of the modal manifestation

Ulrich Ansorge<sup>1,2,3</sup> & Soonja Choi<sup>4</sup>

<sup>1</sup> Department of Cognition, Emotion, and Methods in Psychology, University of Vienna, Austria

<sup>2</sup> Vienna Cognitive Science Hub, University of Vienna, Austria

<sup>3</sup> Research Platform Mediatized Lifeworlds, University of Vienna, Austria

<sup>4</sup> Department of Linguistics and Asian/Middle-Eastern Languages, San Diego State University,  
USA

We present old and novel evidence for the symbolic nature of modal representations. We review research regarding the duration of sensory representations and their temporal characteristics that shows lacking analogy to the represented. We proceed to highlight that proactive selectivity in perception is partly even brought about by linguistic skills. In addition, we highlight important modal and analogous/iconic aspects of language use, a skill that is traditionally considered amodal or symbolic. On the basis of these observations and additional considerations concerning the limited qualitative agreement of modal representations with the represented stimuli, we finally argue for the similarities between modal and symbolic representations.

Keywords: adaptation, selectivity, procedural memory, spatial language, onomatopoeia.

**Keywords:** *adaptation, selectivity, procedural memory, spatial language and representation*

## Invited talk

### Predictions and perception in the human brain - in Gestalt, colour, and magic

Andreas Bartels

University of Tübingen, Germany

The human brain is a prediction machine that builds and relies on an internal world model. Visual perception is deeply influenced by this world model. Is the world modal or amodal? I will review three studies from our lab, each examining neural representations of our internal model. The first study asks about the prior knowledge of the colour of objects such as strawberries or bananas: where or how does the brain encode our knowledge that a strawberry is red? The second study uses a visual dynamic 3D bi-stable illusion to ask: how does the brain segment our world in 3D structure? Also here, the illusion is a result of the brain's internal model of the world and reflects prior (world) knowledge that biases our perception. In the third study we used magic tricks that violate deeply held beliefs of how the world works. Are violations of expectations (VoE) about real-world physics encoded in abstract, prefrontal or also in sensory brain regions?

**Keywords:** *fMRI / functional imaging, predictive coding, colour vision, motion vision, Gestalt, expectation violation*

## Invited talk

### **Perception is modal iconic, non-propositional and non-conceptual whereas cognition is amodal, discursive and conceptual - An empirical argument that perception is non-conceptual**

Ned Block

New York University

The view that perception is non-conceptual has been advocated on armchair grounds but I will present actual experimental evidence for it. I will review evidence that infants between the ages of 6 and 11 months can see colors but normally do not conceptualize them and so normally cannot accomplish even the simplest kinds of cognition involving colors. By contrast, children of the same ages can see shapes and also exhibit rudimentary cognition using shape concepts. I will argue that the upshot is that the color perception of these infants is non-conceptual. I will also present evidence that adults do not have conceptual perception of colors. Color is usually considered a form of “low level” perception as contrasted with perceptual representation of, for example, facial expressions and causal relations and then explore the extrapolation of these findings to high level of perception.

The talk is based on Chapter 6 of this book, a free download from <https://www.nedblock.us/papers/2022.final.proof.pdf>

**Keywords:** *perception, iconic, non-conceptual, non-propositional*

## Invited talk

### **On the relationship between features of an action plan in working memory and the speeded naming of tools/utensils: New empirical evidence and a theoretical framework**

Daniel Bub

University of Victoria, British Columbia, Canada

Consider the following task: Participants hold in working memory (WM) a sequence of two actions (different on each trial) that involve a particular hand (left/right) and orientation of the wrist (horizontal/vertical). While under this memory load, subjects named objects that had a horizontal or vertical handle aligned to the left or right. Naming time was considerably elevated when the WM load and the object's handle matched on one dimension (hand or wrist orientation) but mismatched on the other, relative to when both dimensions were congruent or incongruent with the features in WM. This partial-repetition cost of motor features on naming latency is assumed to occur because bound components of the action plan in WM conflict with the representation triggered by the depicted object. I will build on this result to provide an account of the role of action representations in naming graspable objects.

**Keywords:** Pragmatic representations, semantic representations, feature binding

## Invited talk

### **The format of representations of the abstract relations *same* and *different* in prelinguistic thought**

Susan Carey

Harvard University, Cambridge, Massachusetts, USA

## Invited talk

### Thoughts about actions and outcomes (and what they lead to)

Ruud Custers

Utrecht University, Netherlands

The idea that actions and their perceived outcomes are mentally represented in associative knowledge structures has been influential in different subfields of psychology. Amongst others, it suggests that thinking of, perceiving, or activating outcome representations in any other way can lead to the activation of the associated action representations, triggering goal-directed action. In the current talk I will critically examine the existing evidence for such ideomotor action. I argue that much of the evidence for ideomotor action obtained by the dominant paradigms in the field is open to alternative interpretations and present evidence suggesting that ideomotor action could also result from causal models about actions and outcomes rather than from mere associations between their representations. I conclude that as a result, ideomotor action may be much more situated and flexible than previously thought, which has consequences for our thinking about goal-directed action.

**Keywords:** *goals, ideomotor, regulation, motivation, instrumental learning*

## Invited talk

### **Episodic representations can be both modal and amodal and support flexible relational responding**

Jan De Houwer

Ghent University, Belgium

Behavior could be described as modal or amodal depending on the aspects of the situation (e.g., sensory, abstract) that control it. At the level of information processing, it could be argued that behavior is mediated by the activation of episodic memory representations (i.e., bundles of information about an event as it was experienced). These representations can contain sensory specific information about an event but also abstract, conceptual information depending on the aspects of the situation that determine how the event was experienced. Hence, at both the level of behavior and the level of information processing, the distinction modal/amodal seems to refer to context.

**Keywords:** *episodic representations, propositional models, feature specific attention allocation, relational responding, relational frame theory*

## Invited talk

### **Representation and process in embodied cognition: The case of number concepts**

Martin H. Fischer

University of Potsdam, Germany

Interdisciplinary investigations of the human mind through the “cognitive sciences” have identified a key role of the body for representing knowledge. After characterizing knowledge at grounded, embodied and situated levels, number knowledge is analysed from this hierarchical perspective. Lateralized cortical processing of coarse vs. fine detail is identified as grounding substrate for the population stereotype “few/left, many/right”, which then contributes to number-related sensory and motor biases at the embodied level. Implications of embodied knowledge for education and rehabilitation are mentioned.

**Keywords:** *numerical cognition, sensory and motor biases, processing depth*

## Invited talk

### Head-shape invariant representation of dynamic facial expressions

Martin A. Giese<sup>1</sup>

Collaborators: Michael Stettler<sup>1</sup>, Nick Taubert<sup>1</sup>, Ramona Siebert<sup>2</sup>, Silvia Spadacenta<sup>2</sup>, Peter Dicke<sup>2</sup>, Peter Thier<sup>2</sup>

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Dynamic facial expression recognition is an essential skill of primate communication. While the neural mechanisms to recognize static facial expressions have been extensively investigated, several aspects remain largely unclear. One aspect is the neural encoding of dynamic facial expressions. We studied such mechanisms, exploiting highly-controlled and realistic stimulus sets of dynamic human and monkey expressions exploiting photorealistic avatar models that are animated by motion capture data from both species. We found that facial dynamics seems to be perceptually encoded largely independently of head shape (human or monkey). Especially, humans were able to recognize human expressions spontaneously on monkey faces without any prior training. This property seems incompatible with the popular image-based theories of face recognition. As an alternative, we investigated the hypothesis that facial dynamics might be encoded by norm-referenced encoding (e.g. Leopold et al., Nature, 2006). Using computational modelling, we demonstrate that the recognition of dynamic facial expressions can be accomplished very easily by such architectures, resulting in predictions that seem compatible with data from monkey inferotemporal cortex, as opposed to accounts based on standard recurrent neural networks. Finally, we also demonstrate that norm-referenced encoding might also account for the transfer learning of facial expressions between different head shapes, e.g. from human to monkey faces, requiring only minimal training.

**Acknowledgements:** Supported by HFSP RGP0036/2016, ERC 2019-SyG-RELEVANCE-856495 and NVIDIA Corp.

**Keywords:** *perception, facial expressions, dynamic faces, norm-referenced encoding, invariance, neural models*

## Invited talk

### **Grounding of concrete and abstract concepts in modal experiential brain systems related to perception, action, and introspection**

Markus Kiefer

University of Ulm, Germany

Classical models assume that conceptual knowledge is represented in an amodal format distinct from the sensory-motor and introspective systems. More recent grounded cognition models, however, propose that concepts are embodied in the sense that interactions with the environment form their conceptual memory traces in distributed sensory, action-related or introspective modality-specific brain systems. In neurophysiological experiments, we demonstrate that access to concepts involves a partial reinstatement of brain activity during the perception of objects, the execution of motor actions and the introspection of emotions, mental states and social constellations. We observed an involvement of such experiential brain systems not only in object concepts (e.g., table), but also in abstract everyday concepts (e.g. justice) and in abstract scientific psychological concepts (e.g. conditioning). For abstract concepts, modality-specific brain systems related to the introspection of emotions, mental states and social constellations played a particular role. Both training studies with novel concepts and studies with real concrete and abstract concepts in experts vs. novices revealed experience-dependent brain activity. A conceptual task activated a given modality-specific experiential brain area only when participants had rich interaction experiences with the referent. These findings support the view that both concrete and abstract concepts are grounded in experiential brain systems related to perception, action and introspection as a function of the interaction experience during concept acquisition.

**Keywords:** *conceptual knowledge, grounded cognition, embodied cognition, neuroimaging.*

## Invited talk

### Modality effects in cognitive control: Evidence from task switching

Iring Koch

RWTH Aachen, Germany

In this presentation, I will discuss the role of modality-specific influences in the control of actions and tasks. Inspired by the ideomotor framework, it is assumed that actions are controlled by anticipation of sensory feedback. While there is good evidence for modality-specific effects at the level of control of simple action, the role of modality in the cognitive control of task sets in task-switching contexts is less clear. Traditional “reconfiguration” accounts assume that the costs of task switching (“switch costs”) are mainly due to an amodal process of task-set reconfiguration. Yet, empirical work on modality compatibility suggests that modality-specific crosstalk is a major contributor to switch costs. Modality compatibility is defined as the similarity of the modality of the sensory response feedback to the modality of the target stimulus (e.g., speaking produces auditory feedback, so that auditory targets would be modality-compatible with vocal responses). I will present evidence showing that task switching with two modality-compatible S-R mappings is easier than with two modality-incompatible mappings, even though switching at the stimulus modality level and at the response modality level is equated across these two conditions. Modality-compatibility effects extend across a variety of stimulus and response modalities, and modality compatibility also affects free (“voluntary”) choice of response modality. When discussing these findings in light of the distinction of modal vs. amodal cognition, it is tempting to conclude that cognitive control is modality-specific. Yet, it is still possible that the act of “task-set reconfiguration” is a case for amodal, higher-level, supramodal, stimulus-unspecific cognition. That is, modality-specific influences possibly simply modulate the time that amodal cognitive control takes to effectively reconfigure the task set but do not question the amodal nature of cognitive control at the task level.

**Keywords:** *cognitive control, task switching, modality compatibility*

## Invited talk

### **The role of object structure in representational updating**

Cathleen M. Moore<sup>1</sup> & Elisabeth Hein<sup>2</sup>

<sup>1</sup> University of Iowa, USA

<sup>2</sup> University of Tübingen, Germany

Demonstrations of perceptual organization processes like grouping, surface completion, figure-ground assignment, and correspondence across time and space, are fascinating not just because of their compelling phenomenology, but because they provide insight into different levels of representation and their functions within the cognitive system more generally. In this talk, we will present research that has focused on some of the functional consequences of perceptual organization in visual processing as it unfolds over time. We will suggest that an implication of this work is that perceptual organization processes serve to establish dynamic episodic representations that guide how new visual information is sampled and how it is integrated into existing representations of the external world. This function of perceptual organization, it will be argued, determines what we end up experiencing and what we miss.

## Invited talk

### **First the bones then the flesh: Toward a goal-directed explanation of maladaptive behavior**

Agnes Moors

KU Leuven, Belgium

People often engage in maladaptive behavior, even against their better judgment. For instance, they know that substance use is bad for their health but cannot resist, they know they could do more for the environment but lack the dedication, and they show excessive avoidance of certain threats even according to their own standards. While standard dual-process theories suggest that the breakdown towards maladaptive behavior marks a shift from goal-directed to stimulus-driven (or habitual) processing, I propose an alternative dual-process theory in which goal-directed processes account for the lion share of our behavior, including maladaptive behavior. The theory explains behavior as part of a processing cycle starting with the detection of a discrepancy between a goal or desired state (i.e., valued outcome) and a current state (i.e., stimulus) followed by the selection of one of three broad strategies to reduce this discrepancy: (a) assimilation (i.e., overt behavior selection), (b) accommodation (i.e., changing the initial goal), or immunization (i.e., reinterpreting the stimulus). The theory explains maladaptive behavior as the result of hidden goals and biases in the goal-directed cycle. Biases stem from problems with the salience, uncertainty, and magnitude of the representations. While the distinction between stimulus-driven and goal-directed processes is cashed out in terms of the content of the representations involved (S-R vs. S:R-O) rather than in terms of their (modal vs. amodal) format, the format is likely to contribute to several of these biases.

## Invited talk

### **Does multisensory integration benefit memory?**

Diane Pecher, Brandon Keytel, & René Zeelenberg,

Erasmus University Rotterdam, Netherlands

Previous research has obtained better memory performance for items that were studied in two modalities than in one modality. We investigated the role of multisensory integration and of study-test overlap. Items were presented once as unimodal (picture or sound), once as bimodal (picture and sound), or twice unimodal (once as picture, once as sound) items in a continuous recognition task. In Experiment 1 we found a benefit for items that were studied in both modalities. The benefit did not depend on temporal alignment of picture and sound, which rules out multisensory integration as an explanation. In Experiment 2 we found that repetition of items in the same modality resulted in better memory performance than repetition in different modalities, and we found that memory performance was better when study and test format were the same than when they were different, supporting a role for encoding specificity. We conclude that multisensory integration does not benefit memory.

**Keywords:** *multisensory memory, multisensory integration, encoding specificity, continuous recognition*

## Invited talk

### Investigating the representational format of knowledge: Evidences and insights

Elisa Scerrati

Catholic University of the Sacred Heart Milan, Italy

In this presentation, I will report on a series of experiments aimed at exploring the connections between language and perception and language and action.

First, I will illustrate results concerning the Modality-Switch effect, a cognitive phenomenon consisting in a processing cost or benefit depending on whether people verify concepts' properties involving different or the same (verbally conveyed) sensory modalities.

Then, I will discuss results about a Motor-to-Semantic Priming effect, which involves the pre-activation of motor information by a prime object (for example, the image of a frying pan), subsequently facilitating the processing of target words relevant to actions with those objects.

Finally, I will briefly outline future directions for studying the relationships of language with perception and action through the use of virtual reality technology.

**Keywords:** *semantic processing, action knowledge representation, priming paradigm, property verification, lexical decision*

## Invited talk

### Systems memory consolidation - from modal to amodal?

Monika Schönauer

University of Freiburg, Germany

**Keywords:** *systems memory consolidation, neural plasticity, reactivation, sleep, naturalistic paradigms, human neuroimaging*

## Invited talk

### **In and out of sight: Processing concepts in situated and displaced contexts**

Viktor Kewenig, Jeremy Skipper, & Gabriella Vigliocco

University College London, UK

In real-world language use, comprehenders process conceptual information for referents situated in the immediate physical setting (e.g., a friend talking about their breakfast while both speaker and listener are eating it), as well as displaced (talking about the breakfast afterwards while walking). The recruitment of modal information about concepts may differ in these two scenarios, however, we do not know how because much previous work has focused only representational differences across concepts (e.g., concrete and abstract concepts) using experimental tasks in which the processing of words is decontextualised. Here I will present results from a neuroimaging study of word-level processing in a naturalistic setting (movie watching) that contrast word processing in situated and displaced contexts.

**Keywords:** *language processing during movie watching, visual context, concrete and abstract concepts, context-dependent brain responses*

## Invited talk

### Mental simulation in non-native speakers during language comprehension

René Zeelenberg & Diane Pecher

Erasmus University Rotterdam, Netherlands

In a sentence-picture verification task, pictures of objects are verified faster when they match the shape or color implied by the preceding sentence. This suggests that people mentally simulate these visual characteristics during language comprehension. Whereas the results of studies with native speakers have been largely consistent, studies with non-native speakers have provided inconsistent results. We will discuss several studies from our lab that successfully replicated match effects for non-native English language comprehenders. In addition, we found that participants displayed better delayed recognition memory when the shape of the depicted objects matched the shape that was implied by the sentence than when it did not. Together, these findings suggest that simulations occur spontaneously in non-native language comprehension.

**Keywords:** *mental simulation, sentence-picture verification task, language comprehension, bilingualism*

## **Poster contributions**

**(authors in alphabetical order)**

## Poster contribution

### #1

#### Grain size in modal and amodal event representations

Tolgahan Aydin<sup>1</sup>, Simge Hamaloğlu<sup>2</sup>, Sarah Nolasco<sup>2</sup>, Nadia Said<sup>2</sup>, Daniel T. Levin<sup>3</sup>, & Markus Huff<sup>1,2</sup>

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Granularities of events can be represented differently. Coarser events (e.g., "camping") are defined as higher order than finer events (e.g., "setting up the tent"). We investigated modal and amodal representations of events using grain size in three experiments. Participants saw fine or coarse events in either text or video format where the test stimulus was either video (Experiment 1, N = 88), text (Experiment 2, N = 87), or randomized (text and video; Experiment 3, N = 90). Participants decided if test stimuli fit the events presented. Results showed no interaction between grain size and modalities. Nevertheless, reaction times were longer for coarse events across all three experiments. Findings suggest that (1) coarse events don't lead to more amodal representations, (2) presenting both coarse and fine grain sizes together result in enhanced processing of event structure, and (3) default processing of event models might be amodal.

**Keywords:** *event cognition, grain size, abstraction*

## Poster contribution

#2

### Memory specificity in evaluative conditioning: A multinomial processing tree approach

Karoline Bading, Barbara Kaup, Michael Ramscar, & Mandy Hütter

University of Tübingen, Tübingen, Germany

Evaluative conditioning (EC) is defined as a change in the evaluation of a neutral „conditioned“ stimulus (CS) after its pairing with a valenced „unconditioned“ stimulus (US). EC effects are known to depend on associative memory for the CS-US pairings and to generalize to stimuli that share features with the originally presented CSs (generalization stimuli, GSs). In the present research, we introduce a multinomial processing tree (MPT) approach that combines these two lines of research. We present an MPT model (and its underlying measurement procedure) separating CS/US detection based on specific features vs. non-specific features (which are shared by CSs and GSs), associative memory for the specific US vs. US valence, and general response tendencies (guessing old vs. new, guessing positive US valence vs. negative US valence). We discuss possible pitfalls in model estimation as well as potential applications in future research on memory specificity in EC and its generalization.

## Poster contribution

#3

### **Dessert in Philadelphia, pudding in Tübingen? Investigating the relation of abstraction level and distance in a sentence completion task**

Karin M. Bausenhart, Dina Blunck, Alicia Klötzel, Rolf Ulrich, & Barbara Kaup

University of Tübingen, Tübingen, Germany

A longstanding debate concerns whether information is represented in an abstract/amodal or a concrete/modal format. Recently, a more flexible view has risen, where different representational formats can co-exist and serve specific cognitive functions (see Kaup et al., 2023). For example, Construal Level Theory suggests that objects or events are represented more abstractly when more distant from the self, whether in spatial, temporal, or social terms (Trope & Liberman, 2010). In two online studies, we investigated whether this association of abstraction and distance can be observed in language comprehension. Specifically, we investigated whether participants would complete sentences referring to spatially distant (compared to spatially close locations) with more abstract (compared to more concrete) objects, and vice versa. We observed a reliable association between abstraction and spatial distance only in a sentence-matching task which provides a reference frame to interpret distances and category levels.

**Keywords:** *Construal Level Theory, spatial distance, linguistic processing, cognitive representation*

## Poster contribution

#4

### Reviewing evidence for different representations in perception and action

Kriti Bhatia<sup>1</sup>, Angela Osenberg<sup>1</sup>, Markus Janczyk<sup>2</sup>, & Volker H. Franz<sup>1</sup>

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Tübingen, Germany

<sup>2</sup> Psychological Research Methods and Cognitive Psychology, Department of Psychology,  
University of Bremen, Germany

The Perception-Action Model suggests that distinct representations guide vision-for-perception (more amodal) and vision-for-action (more modal). The model is mainly based on double dissociations between perception and action in patients with lesions in the ventral and dorsal cortical streams. It postulates that these streams process visual input differently, with perception being processed in the ventral stream and visually-guided actions in the dorsal stream. Because patient data have their problems and limitations, results from several behavioural paradigms have been cited as strong evidence supporting this idea in healthy humans. We examined results from three influential paradigms: Weber's law, Garner interference and visual size resolution. We found problems with the statistical rationale (Weber's law, visual size resolution) and empirical inconsistencies (Garner interference). Based on our replications and reanalyses, we conclude that the currently available evidence in these paradigms is problematic and does not provide strong support for the Perception-Action Model.

**Keywords:** *perception & action, grasping, size estimation*

## Poster contribution

#5

### Disentangling population stereotypes from individual differences in ACEs

Francesca Capuano<sup>1</sup>, Daniel Bub<sup>2</sup>, Berry Claus<sup>3</sup>, & Barbara Kaup<sup>1</sup>

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<sup>2</sup> University of Victoria, British Columbia, Canada

<sup>3</sup> University of Hannover, Hannover, Germany

Action-sentence compatibility effects (ACEs) are not sufficient to support strong embodiment: most experiments cannot distinguish whether these effects stem from sensorimotor experience or simply from action stereotypes. Teskey et al. (2022) exploit a case where motoric experience and action stereotype mismatch: opening screw-top lids is performed counterclockwise but is stereotypically associated to a clockwise motion. They find that ACEs on sentences describing the opening/closing of screw-top lids reflect the action stereotype. Concurrently, Capuano et al. (2022) found that individual differences in motoric experience with screw-top lids affected the direction of the ACE. The aim of our study was to disentangle the effect of action stereotypes from that of motoric experience. First, we replicated the findings of Teskey et al. (2022) with an online paradigm. Additionally, we modulated the explicitness of the association of rotation verbs (open/close) with directions of rotation (clockwise/counterclockwise) vs. with motoric experience. We find evidence for a stereotypical association when the task explicitly mentions the directions of rotation. In the tasks where the association is implicit, the effect of the stereotype is suppressed, and a pattern of RTs emerges that is numerically more in line with the predictions of the motoric experience account. However, the latter effects were not found to be significant. The data so far is suggestive that compatibility effects might arise from associations primed by the task, which might be more or less motoric in nature depending on the task. If the task primes an association with a linguistic label, eventual compatibility effects might be less likely to rely on the reactivation of motoric experience. Motoric effects might be more prominent in lab experiments - where participants are required to perform physical movements that are closer to the depicted actions – than in online paradigms.

**Keywords:** *embodiment; ACE; individual differences; population stereotypes; reading-by-rotating*

## Poster contribution

#6

### **Visual tactics: Exploring modal and amodal cognition with if-then plans in identifying food stimuli**

Rabia Dilawar & Caterina Gawrilow

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The efficacy of self-regulation strategies particularly if-then plans (ITPs), in achieving dietary goals is well-documented (Gollwitzer & Sheeran, 2006). However, their impact on the visual identification of food stimuli is less explored. This study investigates the effectiveness of ITPs, where individuals commit to specific responses upon encountering predefined cues, to enhance recognition of both pictorial and textual food stimuli. Our research, grounded in goal-directed behaviour and self-regulation theories, focuses on the under-investigated visual modality of food stimulus recognition.

We hypothesised that ITPs would outperform goal intentions in improving visual identification, measured by quicker detection times and lower error rates. We also predicted faster and more accurate identification of pictorials than textual stimuli due to inherent visual processing advantages. Furthermore, we assessed whether stimulus modality modifies ITP efficacy, anticipating distinctive benefits for textual stimuli.

Using a 2x2 mixed ANOVA design with stimulus modality (pictorial vs. textual) as the within-subjects factor and intervention type (ITP vs. goal intention) as the between-subjects factor, preliminary results indicated higher error rates for pictorial stimuli and longer reaction times for textual stimuli. These findings suggest that the superiority of ITPs was not supported, and stimulus modality significantly affects recognition accuracy and speed, as suggested by previous studies (Webb & Sheeran, 2004).

These initial findings challenge cognitive load theories and suggest new directions for exploring stimulus processing mechanisms. Despite being preliminary, this data provides insights into the differential impacts of cognitive strategies on stimulus recognition, potentially informing more tailored approaches in dietary self-regulation.

**Keywords:** *self-regulation strategies, visual identification, If-then plans (ITPs), stimulus modality*

## Poster contribution

#7

### **Unraveling the relationship between accuracy and confidence: A meta-cognitive perspective within event perception**

Simge Hamaloğlu<sup>1</sup>, Markus Huff<sup>1,2</sup>, Stephen Fleming<sup>3</sup>, Frank Papenmeier<sup>1</sup>, & Nadia Said<sup>1</sup>

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Event completion refers to the phenomenon where observers claim to have perceived visual information that was absent when it is causally implied by other visual cues. In our study we investigate whether observers' ability to make accurate judgments about events not only depends on how precise they can represent those events but also on their confidence in their cognitive processes. We will calculate metacognitive efficiency (M-Ratio), a bias-free indicator of the accuracy-confidence relationship for existing data and a new study. In our experiment, participants watched soccer video clips and indicated whether they observed a critical moment of ball contact (along with confidence ratings) that was either implied causally (e.g., seeing the ball flying; causal) or not (e.g., cheering fans; non-causal). In half of the trials this crucial moment of ball contact was omitted. We hypothesize that detection accuracy and metacognitive efficiency will be lower in the causal compared to the non-causal condition. Our research aims to deepen understanding of information processing and how people assess decision accuracy during event perception.

**Keywords:** *event completion, metacognitive efficiency, confidence, Signal-Detection Theory*

## Poster contribution

#8

### **Stimulus intensity: From neural representation to behavior**

Jürgen Heller, Robert C. G. Johansson, Dorina Kohler, & Rolf Ulrich

University of Tübingen, Tübingen, Germany

This project aims to understand the representational format of stimulus intensity, which allows people to compare stimulus magnitudes both within (i.e., discrimination) and across sensory modalities (i.e., cross-modal matching). Two psychophysical approaches are combined to address this topic from a broader theoretical perspective. The first approach seeks to investigate the long-standing assumption that cross-modal intensity correspondences are absolute, mediated by an amodal intensity representation. The theory of global psychophysics dissociates the underlying correspondences from decision processes related to respondent-generated internal references, which may explain the observed context dependence of cross-modal judgments. This abstract mathematical theory is agnostic regarding the physiological mechanisms underlying intensity perception. It is therefore supplemented by a neurobiologically inspired approach derived from reaction time research which posits that the frequency of neural firings in stimulus-generated spike trains is the cognitive currency of perceived intensity. Common to both approaches is the conjecture that a single encoding strategy for stimulus intensity is used irrespective of sensory modality.

**Keywords:** *intensity processing, psychophysical modeling, multisensory perception*

## Poster contribution

#9

### **Spatial regionalization depends on perceived landmark categorization**

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Regionalisation is the grouping of places into regions, which in turn can affect orientation as interregional distances tend to be overestimated. Further, places in everyday environments are usually named and these names can influence the cognitive construction of regions. We tested the influence of semantic similarity in place names within a virtual environment. The place names allowed for two alternative semantic categorizations corresponding to two equally valid regionalizations. In a priming phase, participants were biased to one of the two categorization schemes. Participants were asked to take the shortest route to given locations and could choose between two equidistant route choices which differed in the number of regional border crossings. We found, that in 61% of all cases participants preferred routes with fewer regional border crossings according to their priming. The results show that semantic similarity in place names can induce regionalisation which can lead to different orientation behaviour even within the same environment.

**Keywords:** *spatial language, cognitive map, regions, route choice, virtual environments*

## Poster contribution

#10

### Cross-modal matching of brightness and loudness and internal references

Katharina Naumann & Jürgen Heller

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'Make the light as bright as the sound is loud.' This is a typical instruction in experiments dealing with the cross-modal matching of stimuli. According to the theory of global psychophysics (Luce, Steingrimsson, & Narens, 2010; Heller, 2021), in such a cross-modal task, the perceived stimulus intensities are judged against respondent-generated internal reference intensities, all represented on a common psychological scale. The internal references are distinguished with respect to their role in the experimental setup, that is, whether they pertain to the standard or to the comparison stimulus in the matching task.

By testing the theory of global psychophysics on cross-modal data, the present study aims at thoroughly investigating the role-sensitivity of the internal reference intensities. Therefore, we replicate a classical experiment by Stevens and Marks (1965), whose participants adjusted the brightness of a light to the perceived loudness of a noise sound and vice versa. Complementing the traditional group-level analysis, we evaluate and model the data on the individual level. We find that the cross-modal matching curves differ in slope, and show a regression effect as reported in the classical literature.

**Keywords:** *cross-modal matching, psychophysics, cognitive modeling, Bayesian estimation*

## Poster contribution

#11

### **When can we and when do we adapt? Evidence that conflict adaptation can transcend contexts early in childhood**

Theodora Hera Potamianou<sup>1</sup> & Donna Bryce<sup>2</sup>

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Developing the ability to focus on relevant information and ignore irrelevant information is crucial for navigating an ever-changing environment. This skill, cognitive control, can be studied using conflict tasks. Performance in these tasks seems to be adjusted based on the current and previous trial's congruency as well as the current and previous task's context. We posit that the ability to adapt across different task contexts would be based on amodal representations since it would require us to abstract across tasks domains. The goal of this study was to study the development and flexibility of cognitive control by assessing conflict adaptation across different age groups and contexts. Two groups of children (aged 6 and 9 years) and one group of adults processed adaptations of the Stroop and Simon tasks and the resulting mouse-tracking variables (total movement time, initiation time, maximum absolute deviation values) were analysed. Across three experiments different context similarities were created depending on which tasks were combined. The results indicate that within-task conflict adaptation does not change qualitatively between 6-year-olds and adults. In contrast, across-task conflict adaptation does. Of note, transfer effects across very different contexts were observed in the youngest group of children, suggesting remarkable flexibility of cognitive control and inviting the possibility of amodal representations being available even early in development.

**Keywords:** *cognitive control, conflict adaptation, Congruency Sequence Effect, mouse-tracking, children, development*

## Poster contribution

#12

### **Chocolate craving and attitude change: Do amodal stimuli differentially influence attitude change towards chocolate in cravers and non-cravers?**

Kathrin Reichmann<sup>1</sup>, Mechteld van den Hoek Ostende<sup>2</sup>, Mandy Hütter<sup>2</sup>, & Jennifer Svaldi<sup>2</sup>

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Craving has been identified as an important component to eating disorders, that can also be observed sub-clinically. It is unclear how craving affects the processing of evaluative information. The present research relied on evaluative conditioning (EC) as an experimental paradigm to study attitude change in cravers versus non-cravers. In EC, evaluative information (unconditioned stimuli, USs) and attitude objects (conditioned stimuli, CSs) are usually presented simultaneously on the screen. As a function of the pairings, evaluations towards the CS change in the direction of the US valence. Most studies present valent images as USs, and images of objects as CSs. However, real-world contexts that employ EC as an intervention to change attitudes do not only rely on images. An example are “nutri-scores” that are used to facilitate healthy food intake. Here, we present the results of three experiments that (1) use “nutri-scores” to induce attitude change, thereby expanding the external validity of the EC paradigm, and (2) consider craving in evaluative learning, thereby increasing our knowledge about processing differences of evaluative stimuli in clinical subgroups.

**Keywords:** *Attitude change, craving, amodal representations, food consumption*

## Poster contribution

#13

### **Human language comprehenders appear to integrate rapidly gestural and verbal expressions of “yes” and “no”: Evidence from a two-choice response time task**

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We explored whether language comprehenders integrate verbal and gestural expressions of the response particles “yes” and “no” instantly, thus investigating multimodal communication in the context of affirmation and rejection. Each trial started with the presentation of a question (“Is the ball in the blue/green box?”) and a blue and green box. Participants then saw a video of an actor answering the question by uttering “yes” or “no” and performing a gesture referring to affirmation or rejection. These information matched or mismatched. Participants were asked to select the correct box based on the verbal clue in one half of the experiment and based on the gestural clue in the other half of the experiment. Responses were faster and more accurate when both information matched, with effects being more pronounced in the affirmation than in the rejection condition. This suggests that rapid integration processes occur, which might be hampered in the case of rejection due to the activation of inhibitory resources.

**Keywords:** *multimodal language, gesture-speech integration, affirmation, rejection*

## Poster contribution

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### Exploring the efficacy of multimodal techniques in L1 German-speakers' acquisition of Persian vocabulary

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Prior investigations have highlighted the advantages of incorporating gestures into language teaching, particularly in enhancing vocabulary acquisition. However, evidence supporting this notion is still limited, leaving several questions unanswered. Notably, it remains unclear whether sensorimotor-enriched techniques yield similar benefits in languages dissimilar to learners' native tongue. In this study, we sought to address this gap by examining the potential advantages of sensorimotor-enriched instruction in learning a language substantially different from participants' first language.

Specifically, we recruited a cohort of young adult native speakers of German (N=80) and introduced them to the Persian equivalents of sixteen German terms. During the training phase, participants were exposed to either traditional vocabulary learning methods or multimodal stimulus presentations. Subsequently, participants underwent testing, including recall and translation assessments. Surprisingly, our findings diverged from previous research, as we did not detect significant discrepancies between the two instructional groups. We offer insights into potential factors contributing to this inconsistency and emphasize the necessity for further exploration.

**Keywords:** *language acquisition, vocabulary learning, sensorimotor techniques, multimodal instruction*

## Poster contribution

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### **Decomposing the Delta plot: Exploring the congruency effect using inhibition and facilitation curves**

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While previous studies investigating neutral condition reaction times showed violations of common assumptions regarding their behavior, they lacked the information fidelity to properly explain these violations. In order to gain the needed level of detail, delta plots are often employed. However, delta plots on reaction time and response errors primarily capture the differences between the congruent and incongruent conditions. As the congruency effect can be decomposed into facilitation and inhibition, the traditional delta plot of the congruency effect can also be decomposed to capture the time-course of facilitation and inhibition in separate curves. To investigate the utility of these curves, an exploratory study was conducted on three conflict task experiments that were run with a speed-accuracy tradeoff measure to further investigate the RT behavior at different boundaries. The results showed evidence for numerous assumptions regarding cognitive control, such as a dominant effect of inhibition driving most of the congruency effect.

**Keywords:** *cognitive control, delta functions, neutral condition*

## Poster contribution

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### Distance effects on mental representations in egocentrically and allocentrically presented hand images

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According to Construal Level Theory (CLT), we represent objects farther from us as more abstract and objects closer to us as more concrete. Teskey (2022) conducted two experiments using ego- and allocentrically presented hand images to investigate whether they would automatically activate motor representations of the left and right hand in a choice reaction time task. Teskey found a positive compatibility effect (with right-hand responses being faster to a target stimulus superimposed on a right-hand image and left-hand responses being faster to a target stimulus superimposed on a left-hand image than vice versa) for egocentrically presented hand images. For allocentrically presented hand images this effect reversed. Interpreting these results from the perspective of CLT, it might be assumed that task-irrelevant images of egocentrically presented hands (close condition) lead to more concrete and modal representations compared to images of allocentrically presented hands (distant condition), because hands presented from an egocentric perspective should be perceived as less socially distant from the self than images of allocentric hands. We replicated Teskeys two experiments by combining them in a blocked within-subjects design and again observed a positive compatibility effect for egocentrically presented hands, which disappeared for the allocentrically presented hands. Furthermore, this interaction was more pronounced at a shorter SOA between presentation of the hand image and the target stimulus, suggesting that the effector-specific motor representation for egocentrically presented hands emerges quickly and automatically. The results indicate that stimuli that are socially closer to us (egocentric) are represented more modally, compared to those that are socially distant from us (allocentric).

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**Keywords:** *construal level, psychological distance, abstraction, mental representation*

## Poster contribution

#17

### Nouns link to typical space in 18- to 24-month-olds

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In adults' (Lachmair et al., 2011) and preschoolers (4-7 years; Vogt et al., 2019) language-space associations are reflected in faster up-responses, when presented with implicit "up words" (i.e. nouns referring to objects that are typically experienced "up", like "moon") compared to "down words". In a previous study, we found evidence of language-space associations in eye-fixation data of children between 2 to 4 years. In our newly developed language-space paradigm, participants showed a visuo-spatial bias: They fixated the upper part of the screen more than the lower part while listening to an "up word" (rather than a "down word"). This was not the case for the tested infants (11-14 months). Here, we probe language-space associations in children between 18- to 24-months ( $n = 17$  [of planned 30],  $M = 19.94$  months). Our preliminary data suggest a visuo-spatial bias within this young age group. Thus, language-space associations appear to be acquired already within the second year of life.

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**Keywords:** eye-tracking, language-space associations, word learning

## Poster contribution

#18

### Restrained eaters' attentional blink to amodal and modal food cues

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Restrained eaters (RE) are characterized by cognitive restraint, as well as lapses in dietary control. Despite preliminary evidence for heightened temporal attentional processing of food cues, it remains uncertain how the variety of (food) cues in our environment influence these processes. Here, RE and unrestrained eaters (URE) completed a rapid serial visual presentation (RSVP) task in which modal (pictures) and amodal (word) food and non-food stimuli functioned as distractors. Event-related potentials (ERPs) were measured concurrently. Although we did not find the expected three-way interaction between Group, Modality and Stimulus Type, we found a significant Group  $\times$  Stimulus Type interaction, indicating that compared to URE, RE provided more correct answers for food, but not for animal distractors. Thus, contrary to the current literature, food was less distracting to RE than URE, independent of cue modality. ERP measurements may provide insight into the nature of this effect.

**Keywords:** *dietary restraint, attentional blink, electroencephalography*

## Poster contribution

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### Language-space compatibility effects: The influence of task demand

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Language-space compatibility effects have been taken as evidence in favor of the embodied account of language comprehension. The literature shows that compatibility effects with language-space associations can be modulated significantly by several experimental features, contrasting the view of context-independent and automatic activation of simulation processes. In three experiments, we investigated the influence of the demand of the response selection stage on the size of the compatibility effect. Across all experiments, words associated with a position in vertical space (up vs. down) were presented in a Stroop-like manner, requiring a motor action for the response. Experiments 1 and 2 employed a two-choice response selection (up vs. down response). Experiment 3 further reduced the demand in the response selection stage by introducing a go/no-go task. A significant compatibility effect was found in Experiment 1 and 2, but not in Experiment 3. This suggests that at least a two-choice response selection is needed to observe a language-space compatibility effect.

**Keywords:** *language comprehension, Stroop, compatibility effects, language-space associations, response-selection stage*