Kognitionspsychologie II: Session 12
Q&A

Rui Mata, FS 2022

Today

- Go over details about the exam and provide a couple of example questions
- Overview of the semester given the questions posted on ADAM

Kognitionspsychologie I & II

20 A-prim, 20 MC

Propädeutische Klausur: Kognitionspsychologie I & II
Für die Beantwortung aller Fragen steht 120 Minuten Zeit zur Verfügung.

Wichtige formale Punkte
– Sie erhalten zwei Dokumente—die Klausur mit den Prüfungsfragen und einen separaten Antwortbogen.
– Bitte tragen Sie Ihren Vornamen, Namen, und die Matrikelnummer in die entsprechenden Felder ein --> bitte leserlich schreiben --> unleserliche Namen und/oder Matrikelnummern können nicht gescannt werden.
– Sowohl den Frage- als auch den Antwortbogen nach der Prüfung in den Umschlag versorgen --> fehlt eines der beiden Dokumente gilt die Prüfung als nicht bestanden!
– Bitte schreiben Sie Ihren Vor- und Nachnamen ebenfalls auf den Umschlag.

Allgemeines
– Die Antworten müssen innerhalb der Prüfungszeit auf den Antwortbogen übertragen sein, indem Sie die entsprechenden Kästchen ankreuzen.
– Verwenden Sie nur die schwarzen Filzstifte, die sie vor der Klausur erhalten.
– Auf dem Antwortbogen sind Korrekturen zu vermeiden (maschinelle Auswertung). Falls Korrekturen notwendig sind, malen Sie die falsch angekreuzten Felder voll aus und kreuzen Sie die richtigen Felder an.
– Es ist daher ratsam, die Lösungen zunächst auf dem Fragebogen zu markieren und dann zu übertragen. Es zählen jedoch nur die Lösungen auf dem Antwortbogen.

Anzahl und Typen der Klausurfragen
Die Klausur enthält ca. 40 Fragen, welche in zwei Fragetypen gegliedert sind. Bei beiden Fragetypen kann maximal je ein Punkt erworben werden.

Fragetyp A
– Jeweils genau eine der fünf Antwortalternativen ist richtig.
– Diese wird auf dem Antwortbogen markiert.
– Es kann nur richtig (ein Punkt) oder falsch (kein Punkt) beantwortet werden.

Fragetyp Multiple-Choice-Frage (Korrekte Antwortkombination)
– Bei diesem Fragetyp gibt es vier Antwortalternativen. Jede Antwortalternative kann richtig oder falsch sein.
– Bei jeder Antwortalternative ist eine Auswahl zu treffen.
– Wenn die Markierung aller Antwortalternativen richtig ist, wird die Aufgabe mit einem Punkt gewertet. In allen anderen Fällen wir die Aufgabe mit Null Punkten bewertet.

Kognitionspsychologie II

Sessions 1-10 are equally covered…

#	Date	Topic	Slides	A	MC
1	02.03.2021	Session 1: Introduction	pdf	1	1
2	09.03.2021	Session 2: What is intelligence?	pdf	1	1
3	16.03.2021	Session 3: Intelligence: Nature & Nurture	pdf	1	1
4	23.03.2021	Session 4: Space	pdf	1	1
5	30.03.2021	Session 5: Number	pdf	1	1
6	06.04.2021	Session 6: Language	pdf	1	1
7	13.04.2021	Session 7: Facts	pdf	1	1
8	20.04.2021	Session 8: Emotion	pdf	1	1
9	27.04.2021	Session 9: Motivation	pdf	1	1
10	04.05.2021	Session 10: Consciousness	pdf	1	1
11	11.05.2021	Session 11: What's next?	pdf		
12	18.05.2021	Session 12: Q&A	pdf		
13	25.05.2021	Exam		**10**	**10**

Kognitionspsychologie II

Example questions

A

Identify the CORRECT statement

A) By convention, about 30% of individuals have an IQ between 85 and 115.
B) Meta-analytic evidence suggests that the correlation between intelligence and job performance is sizable ($r \approx .5$).
C) The correlation between different measurements of *g* of the same individuals using different intelligence batteries is typically small ($r \approx .2$).
D) The more IQ deviates from 100, the more people can be found with similar IQ values.
E) Spearman suggested that *g* is a statistical artifact because every intelligence test taps into different capacities, which can lead to a negative manifold captured by statistical procedures, such as factor analysis.

MC

Which of the following statements is/are correct?

A) Connectionist models are typically implemented as computer programs that simulate cognition through the flow of activation among simple, neuron-like processing units linked to each other through weighted connections.
B) Temporal lobe lesions such as those suffered by patient H.M. tend to lead mostly to deficits in short-term memory.
C) Semantic dementia is usually associated with semantic knowledge deficits as revealed through naming or other non-verbal tests, and typically results from damage to the anterior frontal lobe.
D) According to the hub-and-spokes model of semantic cognition, the lesion of modality-specific components often leads to general semantic deficits.

Exam @ Departement für Sport, Bewegung und Gesundheit (DSBG)

Dienstag 07.06.2022	08.00-10.00 Uhr	DSBG Neubau, Sporthalle 1

After the exam

- Questionnaire about exam over email
- Exam inspection (Einsicht), Tuesday, July 5th, ca. 9:00

Preparation: (Self)-testing and elaboration work best…

Table 4. Utility Assessment and Ratings of Generalizability for Each of the Learning Techniques

Technique	Utility	Learners	Materials	Criterion tasks	Issues for implementation	Educational contexts
Elaborative interrogation	Moderate	P-I	P	I	P	I
Self-explanation	Moderate	P-I	P	P-I	Q	I
Summarization	Low	Q	P-I	Q	Q	I
Highlighting	Low	Q	Q	N	P	N
The keyword mnemonic	Low	Q	Q	Q-I	Q	Q-I
Imagery use for text learning	Low	Q	Q	Q-I	P	I
Rereading	Low	I	P	Q-I	P	I
Practice testing	High	P-I	P	P	P	P
Distributed practice	High	P-I	P	P-I	P	P-I
Interleaved practice	Moderate	I	Q	P-I	P	P-I

Note: A positive (P) rating indicates that available evidence demonstrates efficacy of a learning technique with respect to a given variable or issue. A negative (N) rating indicates that a technique is largely ineffective for a given variable. A qualified (Q) rating indicates that the technique yielded positive effects under some conditions (or in some groups) but not others. An insufficient (I) rating indicates that there is insufficient evidence to support a definitive assessment for one or more factors for a given variable or issue.

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology. *Psychological Science in the Public Interest*, *14*(1), 4–58. http://doi.org/10.1177/1529100612453266

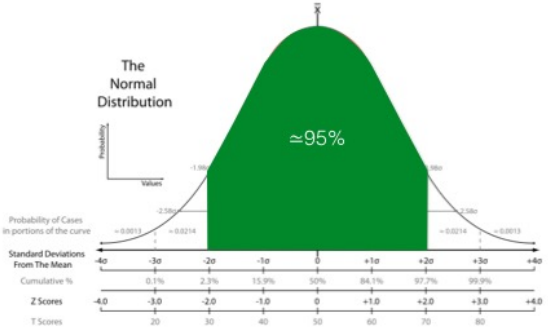
Preparation: (Self)-testing and elaboration work best…

slides **+** **readings**

The Psychometric Approach to Intelligence

Intelligence (as IQ) is a relative statement

"without variation in mental abilities there would be no latent variables—the last survivor of a meteor collision with Earth would still have cognitive abilities and mental limitations but would not have g." (Kovacs & Conway, 2016, p. 153)



The distribution of test results is standardized as having a mean of 100 and a standard deviation of 15. Consequently, about 2/3 of the population have an IQ between 85 and 115. The larger the distance from 100, the fewer individuals can be found with a given IQ.

http://de.wikipedia.org/wiki/Intelligenzquotient

$$IQ = 100 + 15 \times \frac{\text{Raw score - Mean}}{\text{Standard Deviation}}$$

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Opinion

Network Neuroscience Theory of Human Intelligence

Aron K. Barbey[1,2,3,4,5,6,*,@]

An enduring aim of research in the psychological and brain sciences is to understand the nature of individual differences in human intelligence, examining the stunning breadth and diversity of intellectual abilities and the remarkable neurobiological mechanisms from which they arise. This Opinion article surveys recent neuroscience evidence to elucidate how general intelligence, *g*, emerges from individual differences in the network architecture of the human brain. The reviewed findings motivate new insights about how network topology and dynamics account for individual differences in *g*, represented by the Network Neuroscience Theory. According to this framework, *g* emerges from the small-world topology of brain networks and the dynamic reorganization of its community structure in the service of system-wide flexibility and adaptation.

Trends

Accumulating evidence from network neuroscience indicates that *g* depends on the dynamic reorganization of brain networks, modifying their topology and community structure in the service of system-wide flexibility and adaptation.

Whereas crystallized intelligence engages easy-to-reach network states that access prior knowledge and experience, fluid intelligence recruits difficult-to-reach network states that support cognitive flexibility and adaptive problem-solving.

The capacity to flexibly transition between networks states therefore provides the basis for *g* – enabling rapid information exchange across networks and capturing individual differences in information processing at a global level.

This framework sets the stage for new approaches to understanding the neural foundations of *g*, examining individual differences in brain network topology and dynamics.

Spearman's Enigmatic *g*

Research in the psychological and brain sciences has long sought to understand the nature of individual differences in human intelligence, examining the stunning breadth and diversity of intellectual abilities and the remarkable cognitive and neurobiological mechanisms from which they emerge. The foundations of modern research in this effort were established in the early 20th century by Charles Spearman, who developed the correlation method and applied this technique to examine academic achievement within four branches of school study (i.e., English, French, classics, and mathematics) [1,2].

Spearman discovered that correlations in performance reflected characteristics of each discipline, observing that 'English and French, for instance, agree with one another in having a higher correlation with Classics than with Mathematics' [1]. Evidence that all branches of school study were not equally correlated motivated Spearman to conclude that they were influenced, in part, by mental abilities that were specific to each discipline. Beyond identifying the contribution of specific mental abilities, Spearman observed that the correlations among the four branches of school study were always positive. This finding, which is now well-established and named the positive manifold, provided evidence that all cognitive tests measure something in common. Spearman referred to this commonality as the general factor, *g*, which represents the component of individual differences variance that is common across all tests of mental ability.

These early findings motivated Spearman's two-factor model which held that performance on tests of mental ability jointly reflect (i) a specific factor, *s*, that is unique to each test, and (ii) a general factor, *g*, that is common across all tests [1,2]. Contemporary research has further elaborated Spearman's model to include an intermediate level of broad abilities that account for the variance that is shared across similar domains of cognitive ability. For example, the well-established Cattell–Horn–Carroll theory distinguishes between performance on tests of prior knowledge and experience, referred to as crystallized intelligence, from those that require

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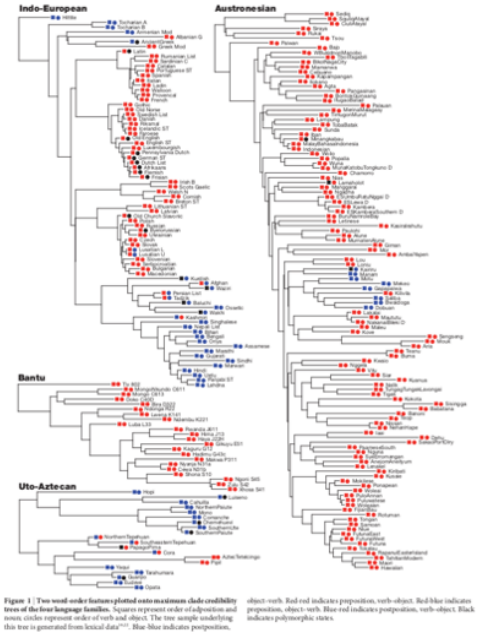
[6]https://www.DecisionNeuroscienceLab.org
[@]Twitter: @DecisionNeurosc
*Correspondence: barbey@illinois.edu (A.K. Barbey).

Questions

What is the difference between the theory of Chomsky and Greenberg (especially what does Greenberg mean by “co-occurrence of traits”)?

Language: Instinct vs. cultural artifact

It became clear(er) across the last decades that human languages are cultural products ruled by cultural transmission and not just biological universals…



“Generative linguists following Chomsky have claimed that linguistic diversity must be constrained by innate parameters that are set as a child learns a language. In contrast, other linguists following Greenberg have claimed that there are statistical tendencies for co-occurrence of traits reflecting universal systems biases, rather than absolute constraints or parametric variation. Here we use computational phylogenetic methods to address the nature of constraints on linguistic diversity in an evolutionary framework. First, contrary to the generative account of parameter setting, we show that the evolution of only a few word-order features of languages are strongly correlated. Second, contrary to the Greenbergian generalizations, we show that most observed functional dependencies between traits are lineage-specific rather than universal tendencies. These findings support the view that—at least with respect to word order—cultural evolution is the primary factor that determines linguistic structure, with the current state of a linguistic system shaping and constraining future states.”

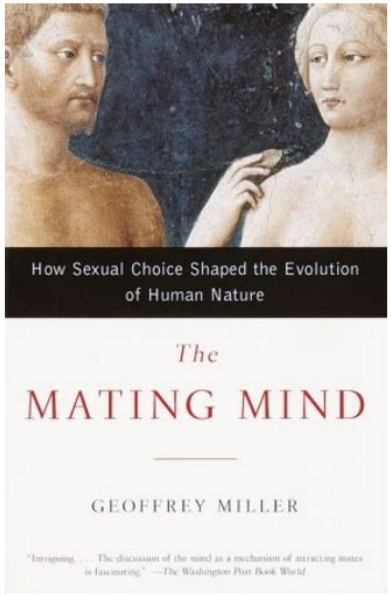
Dunn, M., Greenhill, S. J., Levinson, S. C., & Gray, R. D. (2011). Evolved structure of language shows lineage-specific trends in word-order universals. Nature, 473(7345), 79–82. http://doi.org/10.1038/nature09923 4

Both Chomsky and Greenberg proposed universalist theories of language and see a role for innate constraints. Chomsky and Greenberg disagree about which features should covary in languages (word order).

Questions

The slide was about language and sexual selection, saying: “ If sexual selection favored the minds that seemed fit for mating, our creative intelligence could have evolved not because it gives us any survival advantage, but because it makes us especially vulnerable to revealing our mutations in our behavior.” I am confused by the meaning of that statement. Would you mind explaining to me, what this sentence is saying?

Adaptive significance of language: Sexual selection



“By producing behaviors such as language and art that only a costly, complex brain could produce, we may be advertising our fitness to potential mates. If sexual selection favored the minds that seemed fit for mating, our creative intelligence could have evolved not because it gives us any survival advantage, but because it makes us especially vulnerable to revealing our mutations in our behavior.”

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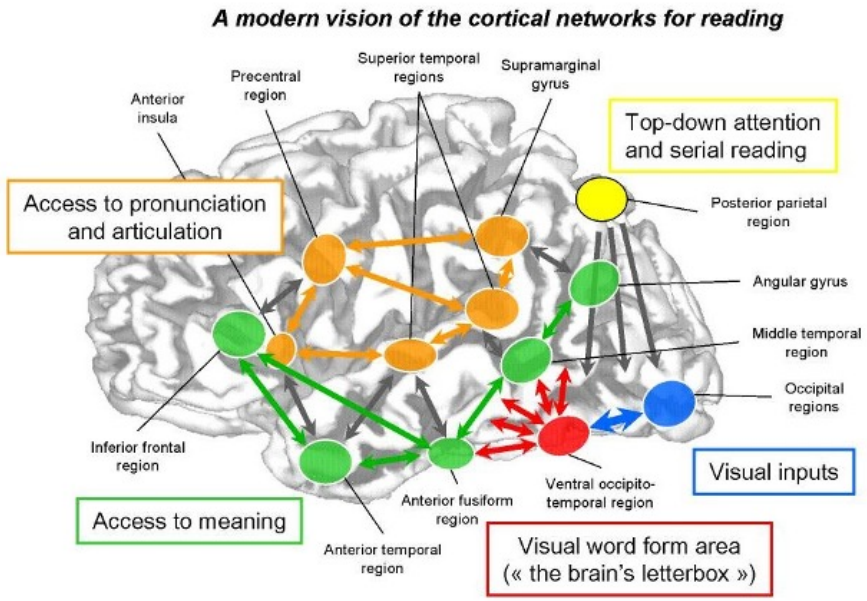
Questions

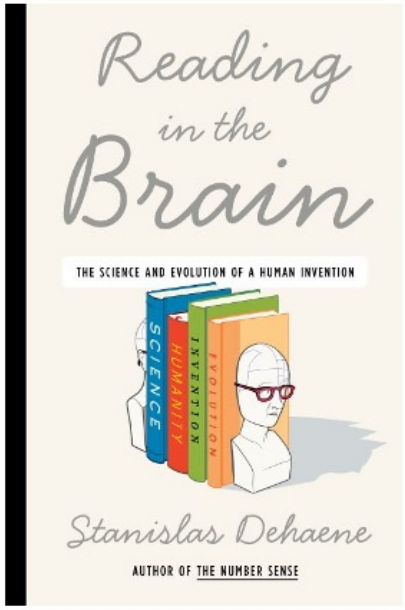
What does the “Neuronal recycling hypothesis” from Dehaene show?

Human language has a typical neural architecture

If oral language is an instinct (or the product of a number of instincts), what about reading and writing?

Stanislas Dehaene proposes a “neuronal recycling” hypothesis, which postulates that cultural inventions invade evolutionarily older brain circuits, and while doing so inherit many of their structural constraints.





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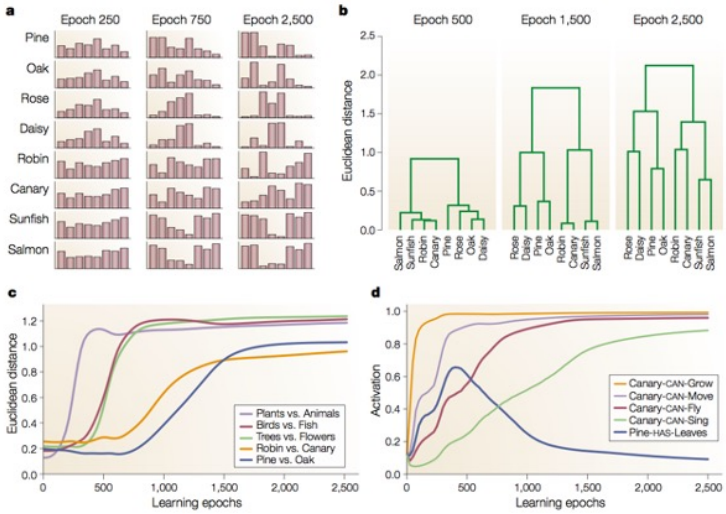
Questions

Semantics/Facts:
Is the main message of the “distributed network model for language” basically that we categorize to simplify the understanding?

Acquiring Semantic Representations

Distributed Networks



a | Patterns of activation in the feedforward network representing the eight objects (e.g., pine, oak, salmon) at three points in the learning process (epochs 250, 750, 2,500).

b | A hierarchical clustering analysis was used to visualize the similarity structure in the patterns of activation. Early in learning, the patterns are relatively undifferentiated; the first difference to appear is between plants and animals. Later, the individual concepts are differentiated, but a hierarchical organization remains showing a clear differentiation at both the superordinate (plant–animal) and intermediate (bird–fish/tree–flower) levels.

c | Pairwise distances between representations of groups of concepts or individual concepts, illustrating the continuous but stage-like character of progressive differentiation.

d | The network's performance in activating various properties of some objects indicating that correct performance is acquired in a general-to-specific manner, and tracks the differentiation of concepts shown in c. Note the activation of 'leaves' when the network is probed with 'pine-HAS'. This shows an inverted 'U'-shaped developmental course, capturing the 'illusory correlations' or incorrect attributions of typical properties.

The toy example suggests that learning of concepts can be acquired over time through learning of features. Crucially, it leads to interesting developmental patterns (global-to-basic) and errors (over-generalization). One should, however, note that learning by supervised learning via back-propagation is not particularly plausible.

McClelland, J. L. & Rogers, T. T. (2003). The parallel distributed processing approach to semantic cognition. ***Nature Reviews Neuroscience, 4,*** 310-322.

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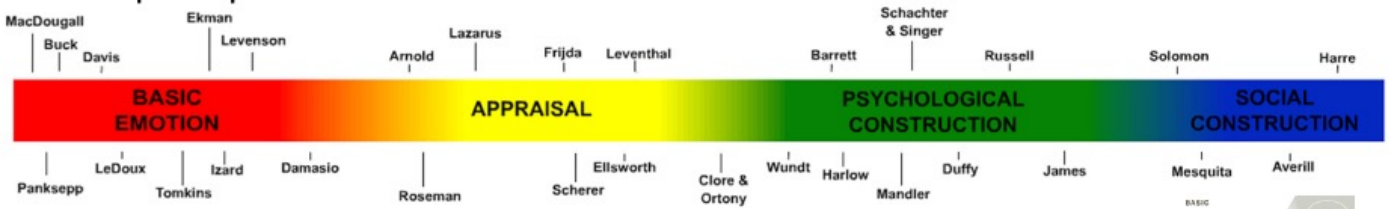
Questions

Would you say that according to the „appraisal approach“ emotions are rather specific (in relation to biological processes) or would you also put them in the constructivist approaches such as the psychological and social construction theories?

Is the difference between “basis emotion perspective” and “appraisal theory” that according to appraisal theory emotions are not specific to a mechanism?

Four perspectives on emotion



Basic Emotion: emotion words such as “anger,” sadness,” and “fear” each name a unique mechanism that causes a unique mental state with unique measurable outcomes.

Appraisal: emotion words name privileged mental states that are unique in form, function, and cause from other mental states, but “anger,” “sadness,” “fear,” and other emotion words do not name distinct, dedicated mental mechanisms per se. Instead, emotions are linked to appraisals which in turn trigger biologically basic emotional responses characterised either by stereotyped outputs or by a strong and almost inescapable tendency to interact with the world in a particular way (both fear and surprise are linked to the appraisals of uncertainty).

Psychological Construction: all mental states are seen as emerging from an ongoing, continually modified constructive process that involves more basic ingredients that are not specific to emotion.

Social Construction: Emotions are viewed as social artifacts or culturally-prescribed performances that are constituted by sociocultural factors, and constrained by participant roles and social context.

Gross, J.J, & Barrett, L.F. (2011). Emotion generation and emotion regulation: One or two depends on your point of view. ***Emotion Review, 3***, 8–16.

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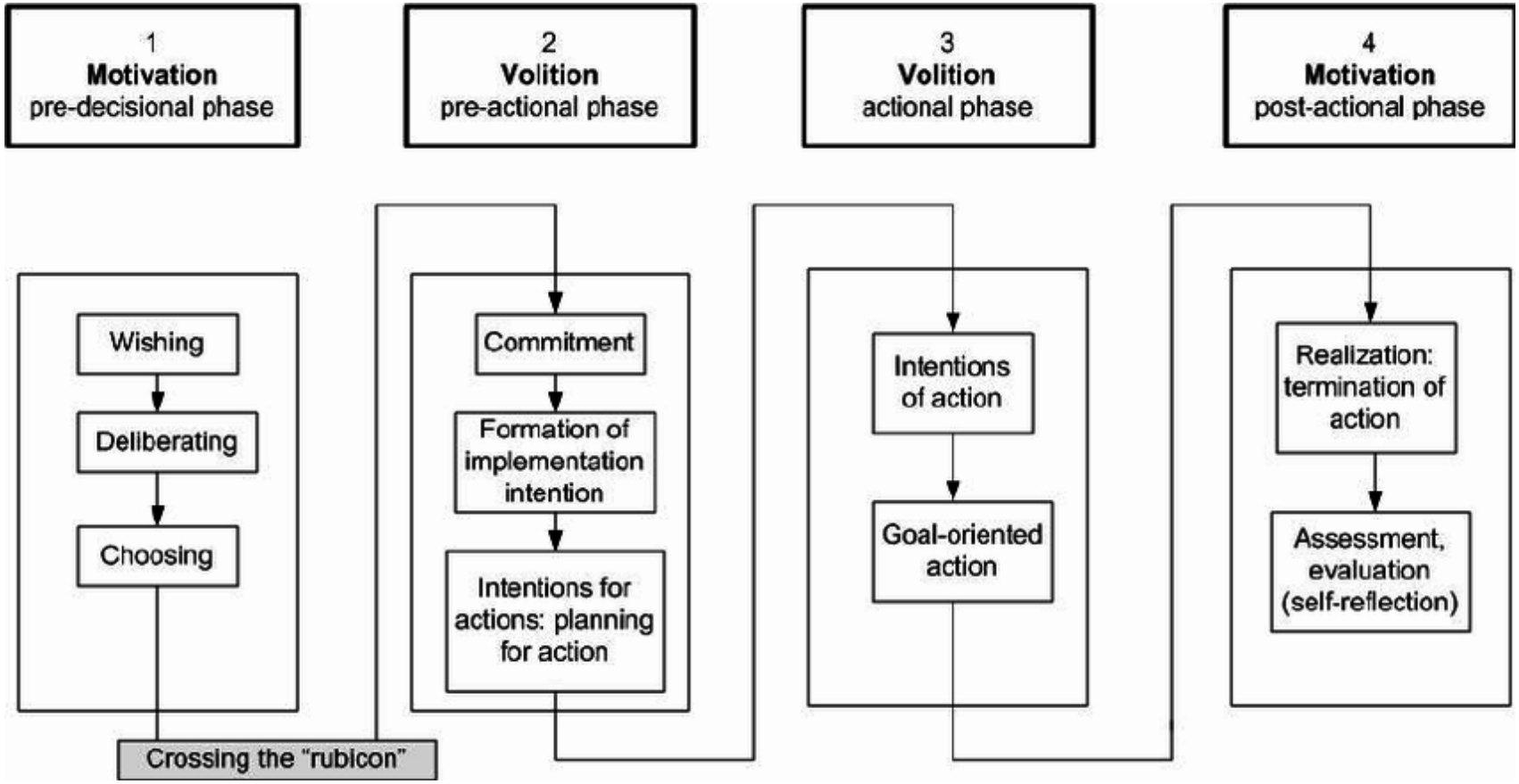
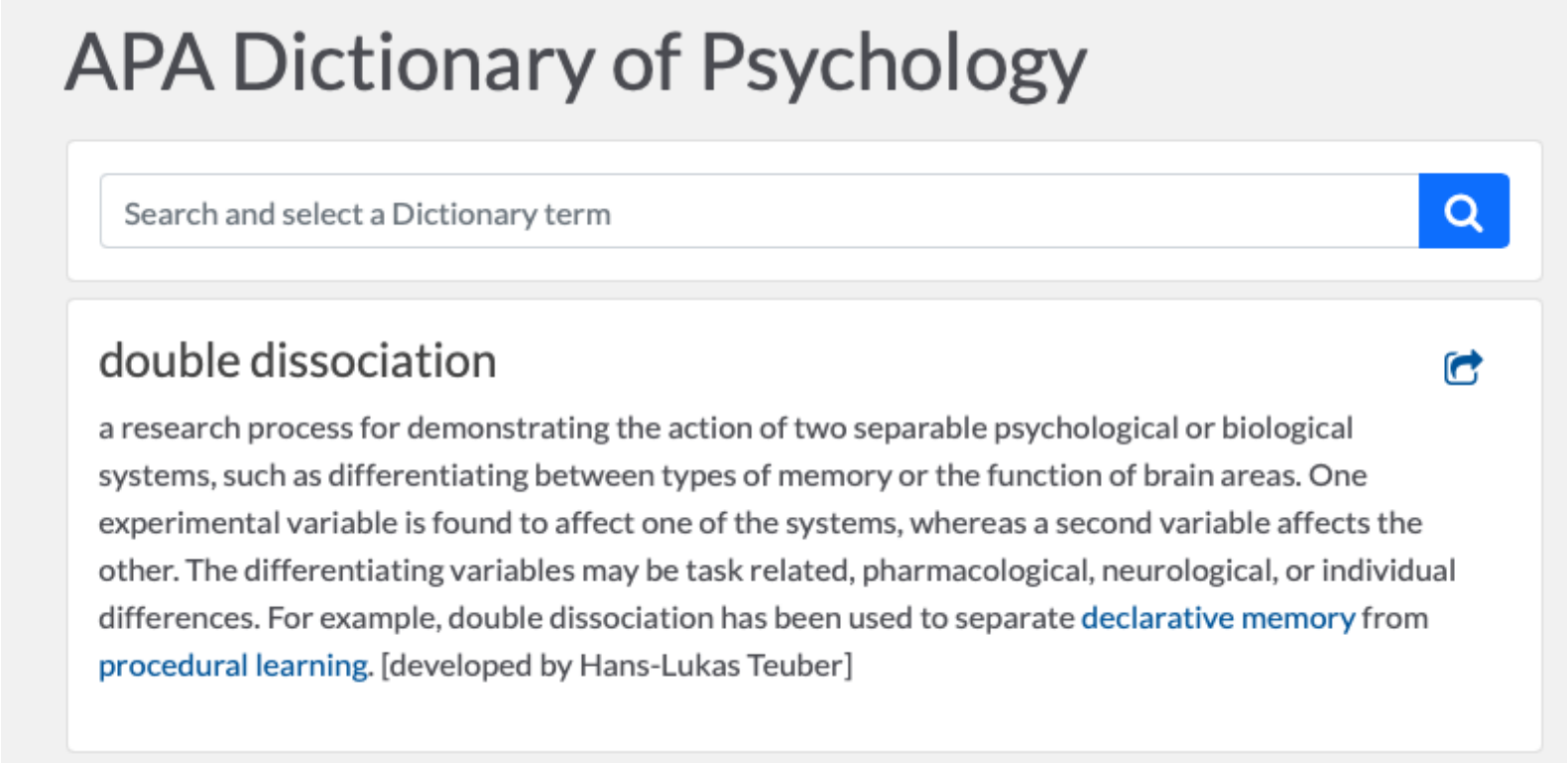
Questions

On what factors does the “Rubicon model” depend? On motivation in general (intrinsic, extrinsic, emotion, mood) or is this context-specific?



Questions

Modularity/Consciousness:
Is the “double dissociation effect” by lesions an evidence for the modularity theory? (example: brain lesion on amygdala affects our perception of fear, but not the perception of other emotions)



Questions

In the paper by Dehaene et al. (2006) there is on page 3 a table about subliminal, preconscious and conscious processing. In social psychology we discussed an experiment that took place in a shop where they sold French and German wine. They found out, that when French music was played, customers bought more French wine, and the nex day when German music was played, customers bought more German wine. It was an example for priming that worked.
Where in the table of the paper would you put this example? My friend thougt, it would be subliminal (unattended) but I think it is preconscious because you hear the music quite well, the brain just doesn't count it for important enough to really pay attention to it, because there is always music in the stores...