

Workshop

2024-02-28

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# BACKBONE — RATIONALE AND ADMINISTRATION

# GOALS



- Give an overview of the Backbone and its assessment
- Stimulate discussion and get your feedback with respect to refinements of the backbone → “*now or never*” 😊
- Provide further resources



# AGENDA



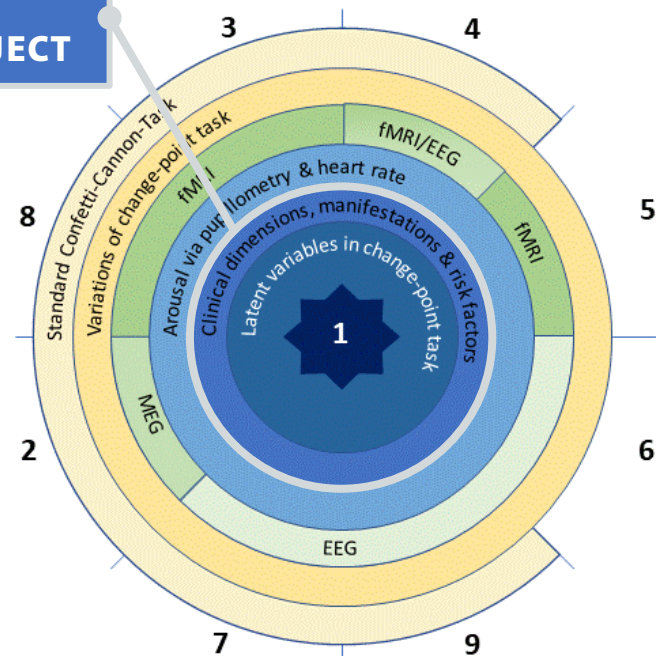
1. Backbone Overview
2. Getting to know the Backbone
3. Theoretical Background on Constructs
4. Assessment

# BACKBONE OVERVIEW



## STANDARDIZED BATTERY OF QUESTIONNAIRES AND COGNITIVE TESTS THAT WILL BE ASSESSED IN EACH PROJECT

- **Transdiagnostic & dimensional approach**
  - **Clinical manifestations** of theoretical and empirical relevance to DynBU that are included in the Hierarchical Taxonomy of Psychopathology
  - **Trait markers & vulnerability factors** associated with various clinical manifestations and are likely related to DynBU
  - **Genetic & environmental risk factors** shared across clinical disorders
- **Neuropsychological tests:** Dissociate disturbances in DynBU under uncertainty from general disturbances in cognition



# RU5389 OVERARCHING AIMS



**Aim 1 –  
Neurocognitive  
mechanisms  
of DynBU**

**Aim 2 –  
Development  
and context  
effects on DynBU**

**Aim 3 – Clinical  
manifestations  
of DynBU and  
their origins**

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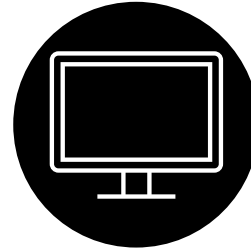
# BACKBONE OVERVIEW



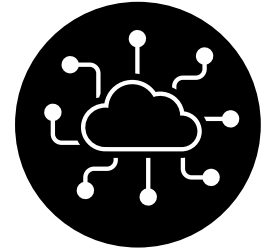
**COGNITIVE TESTS**



**QUESTIONNAIRES**



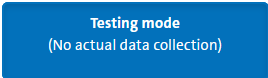
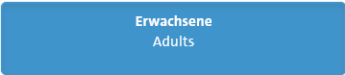
**COMPUTERIZED**



**DATA  
CENTRALIZATION**

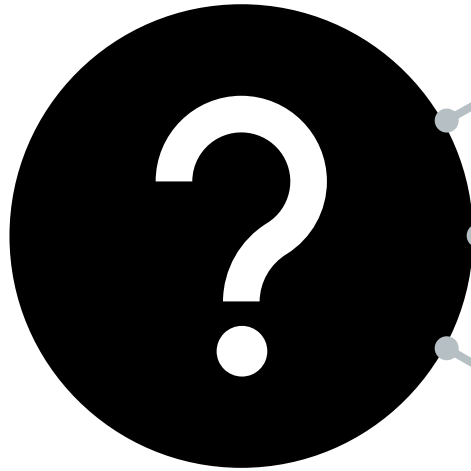
# GETTING TO KNOW THE BACKBONE



1. Please visit <https://umfragen.uni-hamburg.de/ru5389bb>
2. Please fill in the “experimenter page” by selecting
  - Project:   
Testing mode  
(No actual data collection)
  - Participant-ID: “999”
  - Sample:   
Erwachsene  
Adults
3. Complete the Backbone (you do not need to answer truthfully)
4. Please keep your project + sample in mind during completion – and note down any questions/feedback that may occur on the way



# FEEDBACK

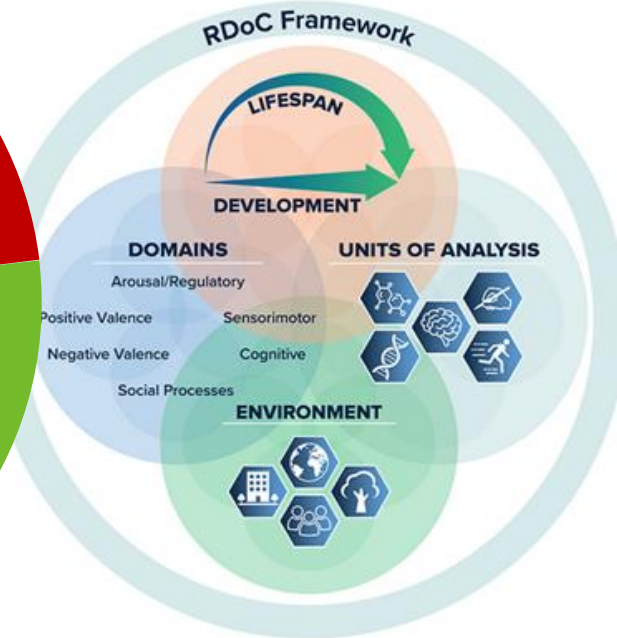
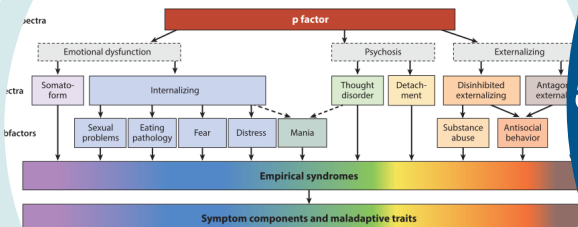


Contents?

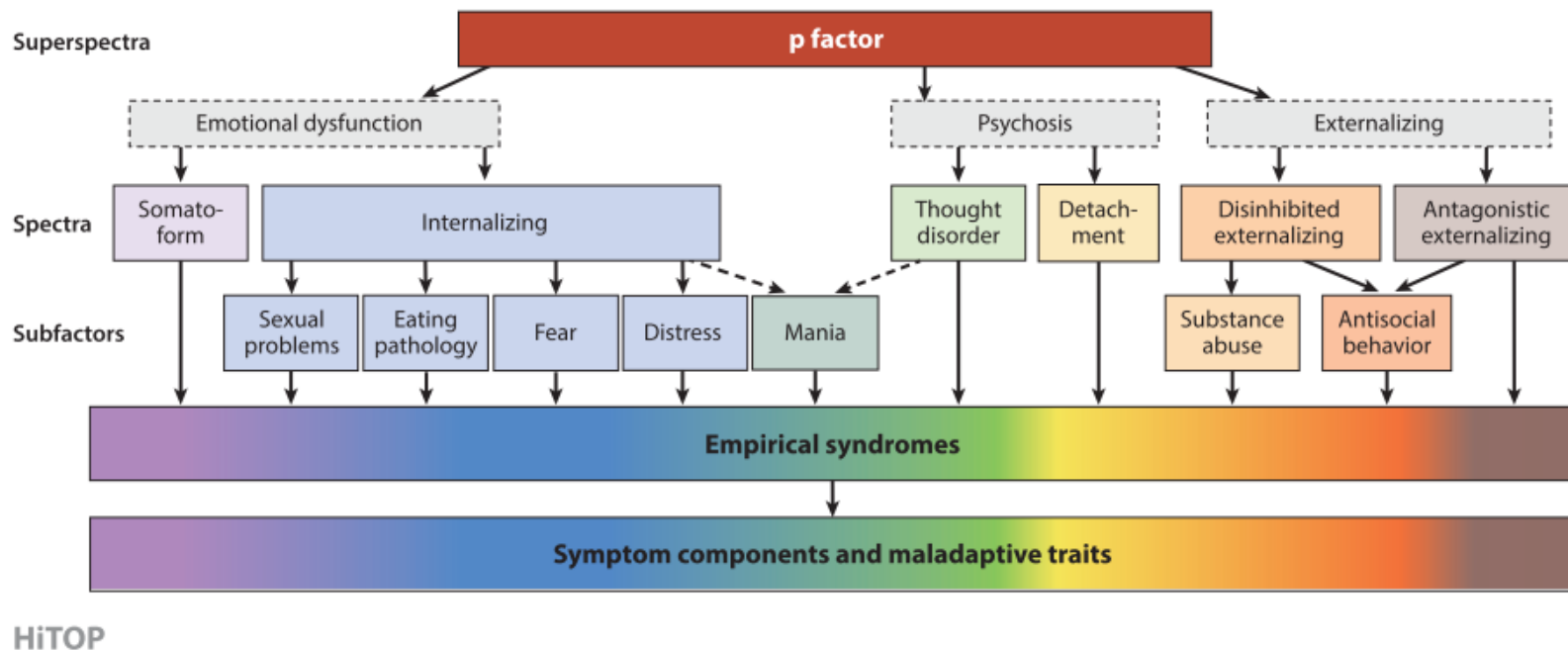
Administration?

Thoughts, questions, comments?

# BACKBONE CONSTRUCTS

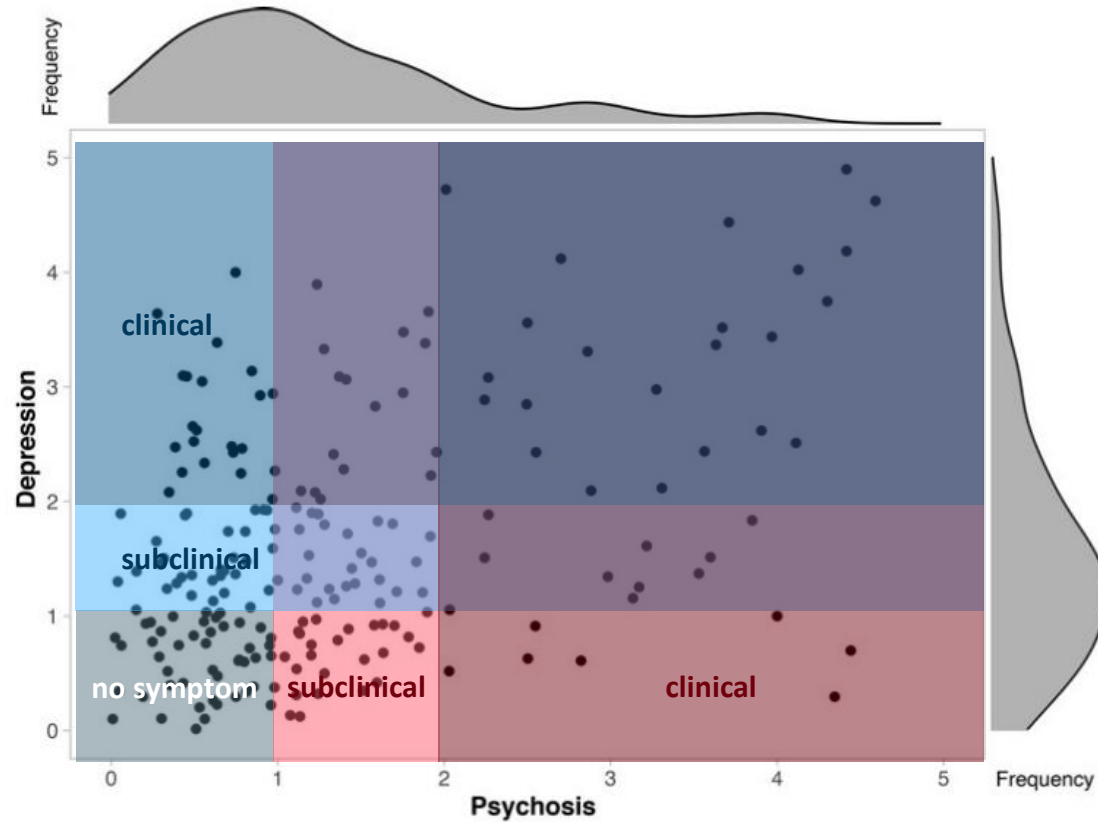


# HIERARCHICAL TAXONOMY OF PSYCHOPATHOLOGY

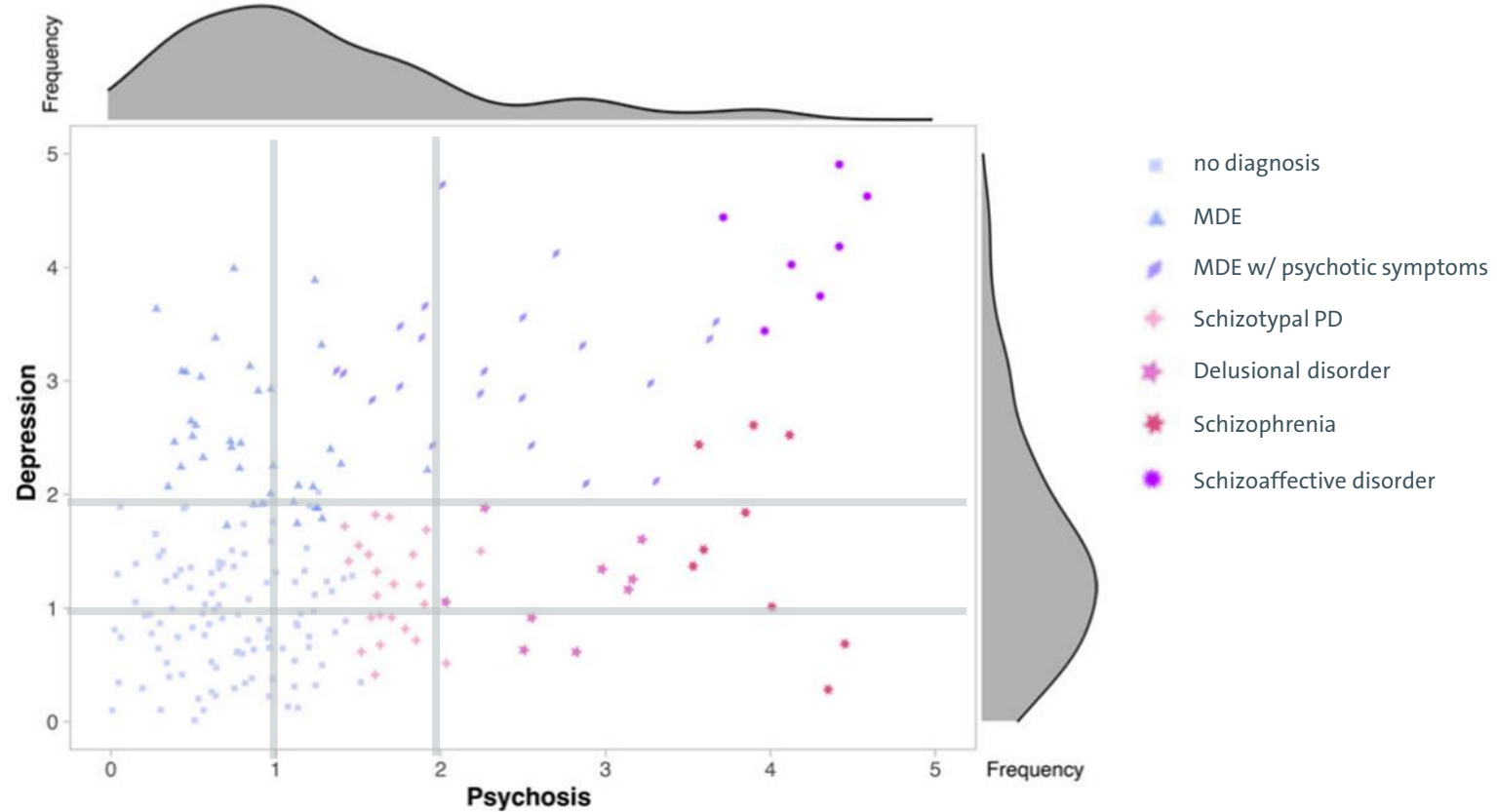


**“HiTOP is a living model not yet finalized, and may never be finalized”**

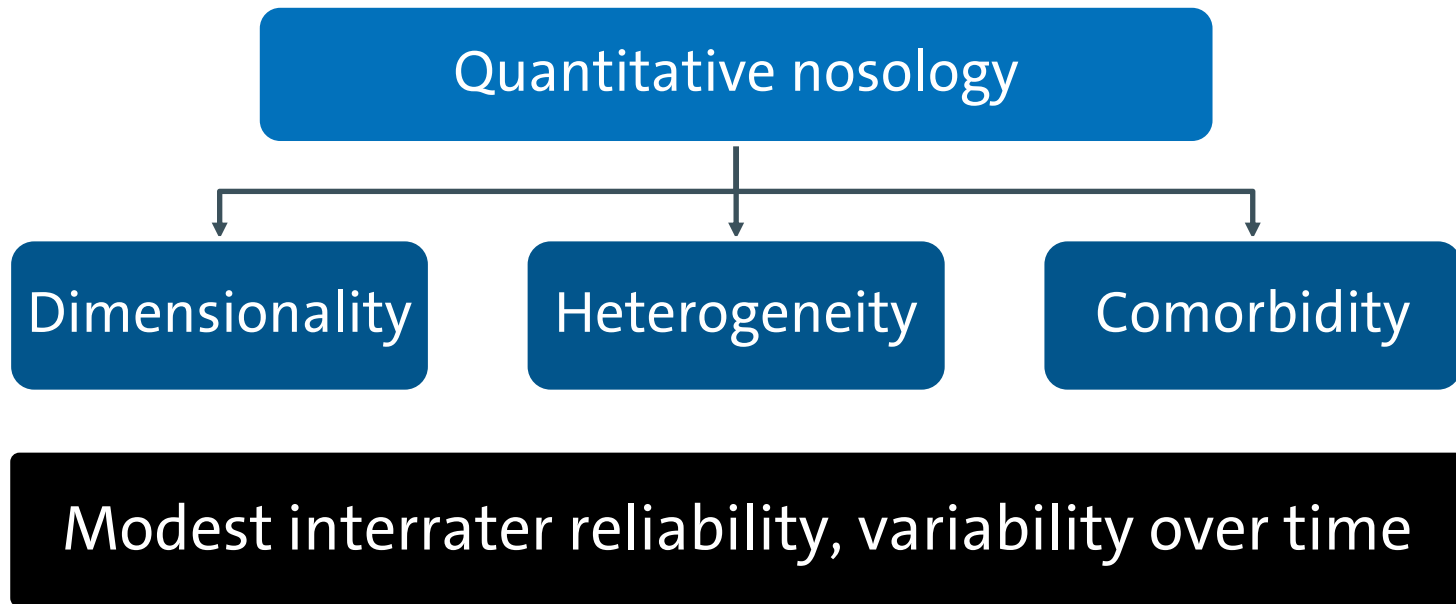
# TRADITIONAL DIAGNOSTIC SYSTEMS



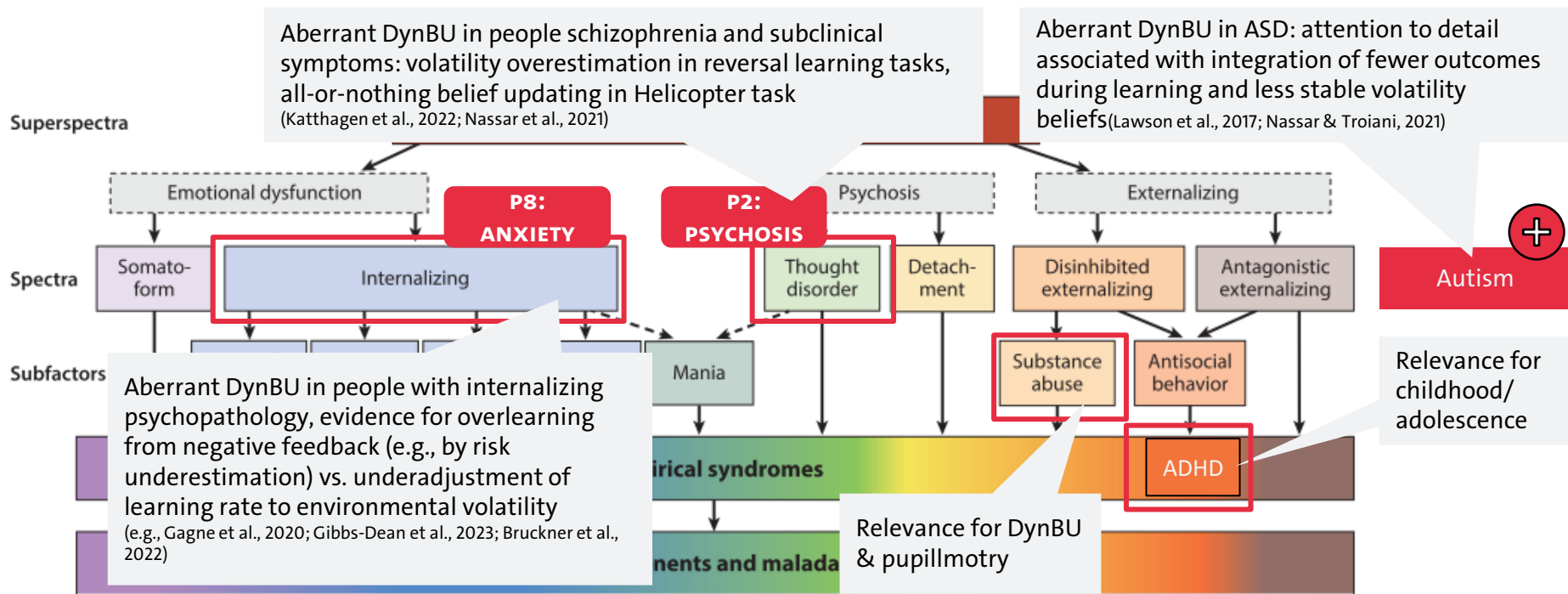
# TRADITIONAL DIAGNOSTIC SYSTEMS



# AIMS OF THE HiTOP MODEL



# HITOP IN THE BACKBONE



- Previous research indicates aberrant DynBU across psychopathology, especially our target dimensions, BUT: huge methodological variability
- We use a common task, common model of belief updating, and a dimensional/transdiagnostic approach in a huge sample to target aberrant DynBU as a transdiagnostic mechanism

# BACKBONE MEASURES



CONSTRUCTS	MEASUREMENTS	ITEMS	CALCULATED	PILOT ADULTS (N = 28)
CLINICAL MANIFESTATIONS			24 min	11.66 (3.65)
Internalizing	Inventory of Depression and Anxiety symptoms (IDAS-II)	98	15	5.97 (1.56)
Thought disorder	Community Assessment of Psychic Experiences (CAPE), positive dimension	20	4	2.30 (0.69)
Autism	Autism Spectrum Quotient, short form (AQ-10)	10	2	1.17 (0.39)
Externalizing	Substance Use Questionnaire (SUQ)	≥ 9	2	1.26 (0.58)
	World Health Organization Adult Attention-Deficit/Hyperactivity Disorder Self-Report Screening Scale for DSM-5 (ASRS-5)	6	1	0.96 (0.43)

## IDAS-II: 18 non-overlapping scales (past 2 weeks); 1-5

Dysphoria, Well-being, Panic, Cleaning, Lassitude, Insomnia, Suicidality, Social Anxiety, Ill-temper, Mania, Euphoria, Claustrophobia, Ordering, Traumatic Avoidance, Traumatic Intrusions, Checking, Appetite Loss, Appetite Gain  
+ General Depression scale

(Watson et al., 2012)

## CAPE: Positive dimension (past 4 weeks); 0-3

- Frequency of symptoms
  - Symptom-related distress
- (Stefanis et al., 2002; Schlier et al., 2015)

## SUQ: (lifetime, frequency, quantity)

Alcohol, Tobacco, Cannabis, Stimulants, Opioids, Hallucinogens, Inhalants, Medication, other

## AQ-10: (trait); 0-3

Attention to detail, Imagination, Communication, Attention switching, Social

## ASRS-5: (frequency); 0-4

e.g., *How often do you leave the seat when you are expected to remain seated?*  
(Anbarasan et al., 2020)



Sollten Sie sich in einer **psychischen Krise befinden oder Gesprächsbedarf haben** und sich Hilfe wünschen, finden Sie bei der Bundespsychotherapeutenkammer Informationen über Hilfsangebote.

Falls Sie diese Informationen abrufen möchten, können Sie entweder mit Ihrem Handy den QR-Code scannen oder <https://bptk.de/patient-innen/> besuchen.

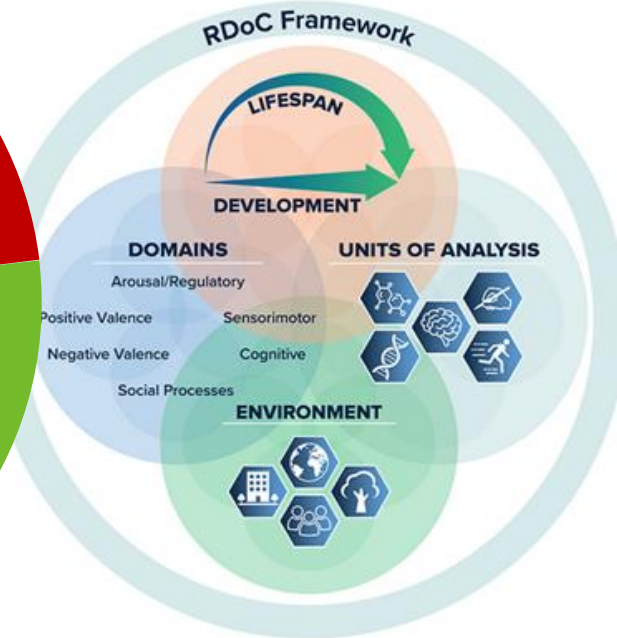
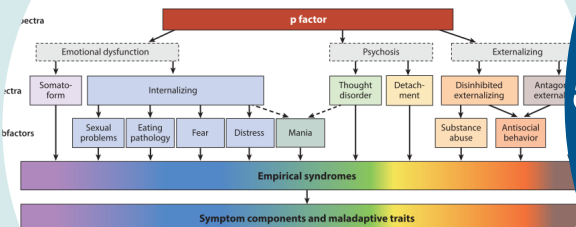
Die **Telefonseelsorge** ist unter 0800 1110111 oder 0800 1110222 rund um die Uhr erreichbar.

Falls Sie in in diesem Moment Gesprächsbedarf haben, sprechen Sie bitte die Versuchsleitung an.



- All adult samples are prompted with this information
- Adolescents (and children) are not prompted with this information; in case they state suicidal ideation in the interviews, appropriate measures will be taken

# BACKBONE CONSTRUCTS



# RESEARCH DOMAIN CRITERIA

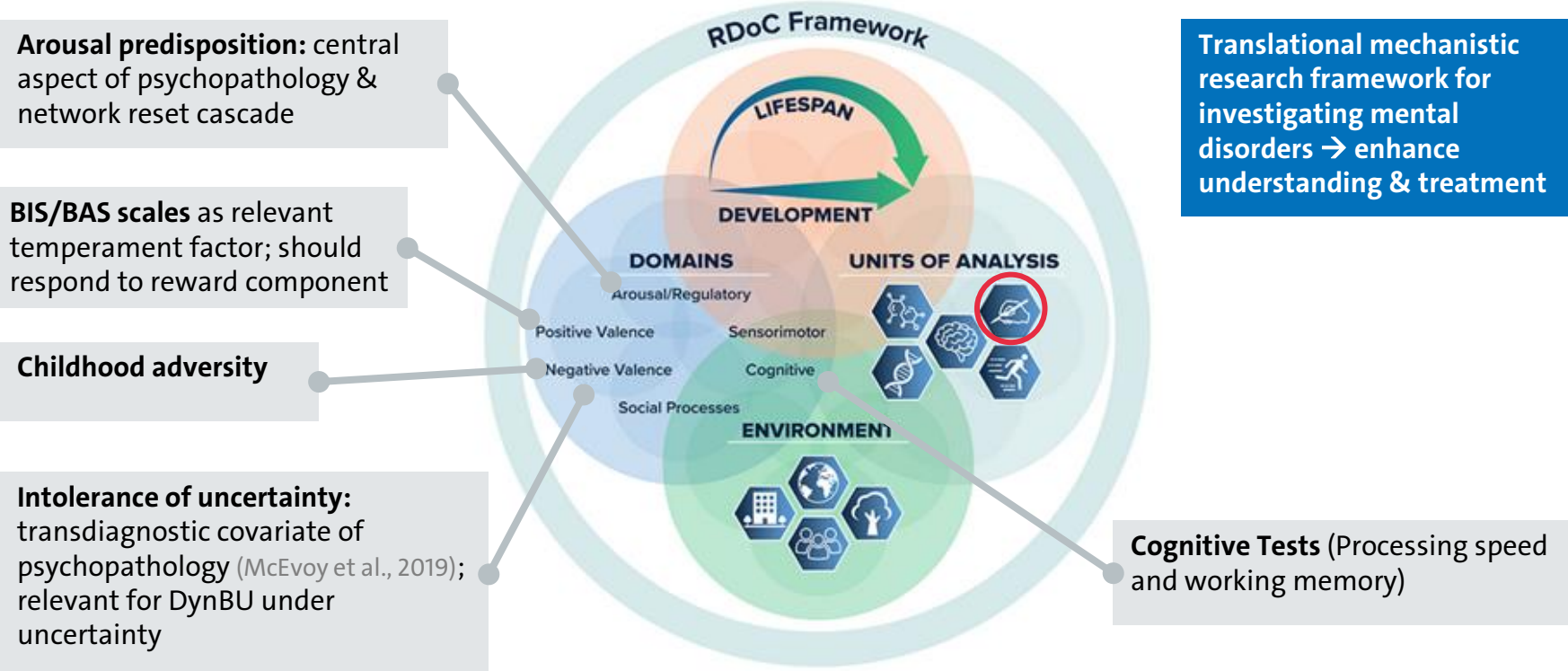
**Arousal predisposition:** central aspect of psychopathology & network reset cascade

**BIS/BAS scales** as relevant temperament factor; should respond to reward component

**Childhood adversity**

**Intolerance of uncertainty:** transdiagnostic covariate of psychopathology (McEvoy et al., 2019); relevant for DynBU under uncertainty

Translational mechanistic research framework for investigating mental disorders → enhance understanding & treatment



# COGNITIVE TESTS



## PROCESSING SPEED

### SYMBOL CODING (BACS)

⊃	≡	>	X	Λ	=	*	∃	∞
1	2	3	4	5	6	7	8	9

⊃

1



#### Matrics Consensus Cognitive Battery (MCCB): BACS-Symbol coding

- Max. 110 symbols (fixed order)
- Duration: aborted after 90 sec
- Total score = correct - errors

+ standardization, efficiency  
- test norms based on paper-pencil

## WORKING MEMORY

### LETTER NUMBER SPAN (LNS)



C-8-M

8CM

AI-generated,  
1000ms



#### Matrics Consensus Cognitive Battery (MCCB): LNS

- Digit-and-letter-series need to be sorted (digits ascending, letters alphabetical)
- 6 stages: 2 vs. 3 vs. 4 vs. 5 vs. 6 vs. 7 elements, 4 series per stage
- Stop criterion: all 4 of a stage wrong
- Score = total number correct

## COGNITIVE FLEXIBILITY

### WISCONSIN CARD SORTING (WCST-64)

Inclusive  
colors



#### Wisconsin Card Sorting task, 64 Card version

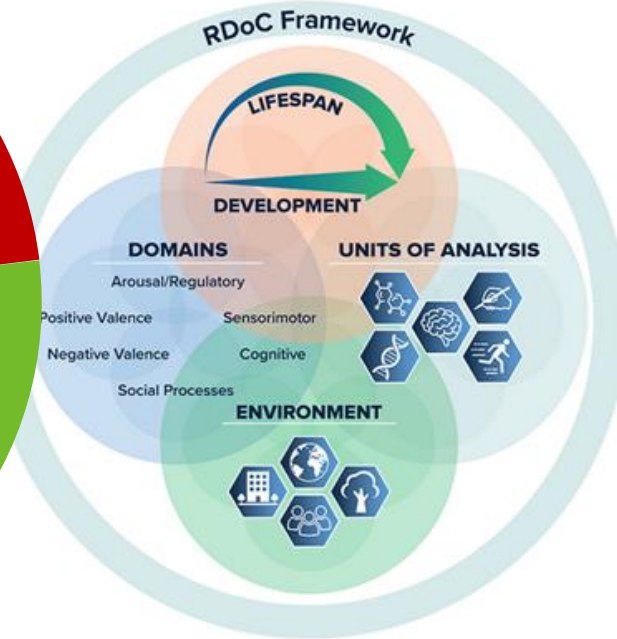
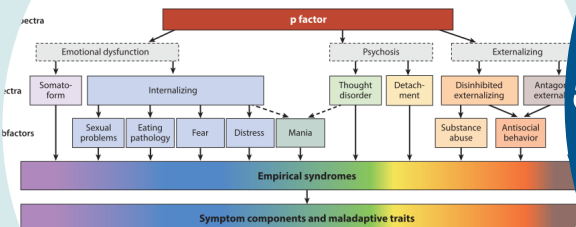
- 60 cards need to be sorted according to rule that needs to be inferred (color vs. symbol vs. shape)
- Rule reverses after 10 correct
- Score = total number of achieved reversals

# BACKBONE MEASURES

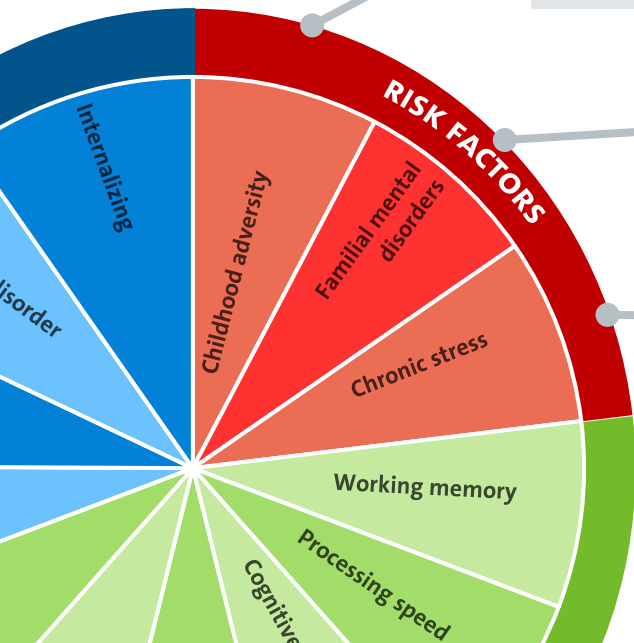


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	World Health Organization Adult Attention-Deficit/Hyperactivity Disorder Self-Report Screening Scale for DSM-5 (ASRS-5)	6	1	0.96 (0.43)
<b>DIMENSIONS/TRAITS</b>			<b>37 min</b>	<b>23.57 (1.88)</b>
Behavioral inhibition	BIS/BAS Scales	24	5	2.55 (0.76)
Intolerance of uncertainty	Intolerance of Uncertainty Scale	18	3	2.57 (0.59)
Arousal predisposition	Arousal Predisposition Scale (APS)	12	3	1.44 (0.72)
Chronic stress	Trier Inventory for Chronic Stress, short form (TICS-9)	9	2	0.92 (0.29)
Cognitive flexibility	The Wisconsin Card Sorting Test – 64 Card Version (WCST-64)		15	5.59 (0.75)
Processing speed	Brief Cognition in Schizophrenia (BACS): Symbol-Coding, as used in the MATRICS Consensus Cognitive Battery (MCCB)		3	10.5 (1.20)
Working memory	Letter-Number span, as used in the MCCB		6	

# BACKBONE CONSTRUCTS



# BACKBONE CONSTRUCTS



**Childhood adversity** (e.g., physical, sexual, or emotional abuse, neglect) is an unspecific risk factor for the development of mental disorders (e.g., umbrella review: Sahle et al., 2022; Varchmin et al., 2021), first evidence of association with volatility overestimation (Sloan et al., 2023)

**Familial mental disorders** can be seen as a proxy for genetic effects (e.g., psychotic disorders have a high heritability)

**Chronic stress** is an integral element of many etiological models of mental disorders (e.g., vulnerability-stress-models) and may also affect belief updating (Peters et al., 2017)

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Processing speed	Brief Cognition in Schizophrenia (BACS): Symbol-Coding, as used in the Cognitive Battery (MCCB)			10.5 (1.20)
Working memory	Letter-Number span, as used in the MCCB		6	
<b>GENETIC &amp; ENVIRONMENTAL RISK</b>			<b>15 min</b>	<b>2.86 (0.97)</b>
Childhood adversity	Childhood Trauma Questionnaire (CTQ-SF), short form	28	5	2.36 (0.86)
Familial mental disorders	Family History Screen, short form		10	0.50 (0.45)
<b>GENERAL INFORMATION</b>			<b>6 min</b>	<b>0.94 (0.40)</b>
Socio-demographics	e.g., age, sex, gender, education			0.40 (0.10)
Health status	e.g., smoking, caffeine, medication, alcohol consumption, weight, height			0.54 (0.39)
<b>Total</b>			<b>82</b>	<b>40.6 (6.07)</b>

Well-accepted by adolescents  
(Hagdorn et al., 2022)



# BACKBONE MEASURES: CODEBOOKS




Fragebogen	Skala	Codierung	ItemNr.	Item	Antwortskala
IUS		IUS1	Instruktion	Im Folgenden finden Sie eine Reihe von Aussagen, die beschreiben, wie Menschen auf die Unsicherheiten des Lebens reagieren. Bitte geben Sie jeweils an, wie charakteristisch (d.h. typisch) die einzelnen Aussagen für Sie sind.	Überhaupt nicht charakteristisch für mich (1); (2); Einigermaßen charakteristisch für mich (3); (4); Völlig charakteristisch für mich (5)
IUS		IUS001	1	Unsicherheit hindert mich daran, eine starke Meinung zu haben	
IUS		IUS002	2	Unsicher zu sein bedeutet, dass eine Person unorganisiert ist	
IUS		IUS003	3	Unsicherheit macht das Leben unerträglich	
IUS		IUS004	4	Es ist ungerecht, dass es im Leben keine Garantien gibt	
IUS		IUS005	5	Ich kann mich nicht entspannen, wenn ich nicht weiß, was morgen passieren wird	
IUS		IUS006	6	Unsicherheit bereitet mir Unbehagen, Angst oder Stress	
IUS		IUS007	7	Unvorhergesehene Ereignisse nehmen mich sehr mit	
IUS		IUS008	8	Es frustriert mich, nicht alle Informationen zu haben, die ich brauche	
IUS		IUS009	9	Unsicherheit hindert mich daran, ein erfülltes Leben zu führen	
IUS		IUS010	10	Man sollte immer vorausschauen, sodass man Überraschungen vermeidet	
IUS		IUS011	11	Ein kleines unvorhergesehenes Ereignis kann alles verderben, trotz bester Planung	
IUS		IUS012	12	Unsicherheit lähmt mich, wenn es Zeit ist, zu handeln	
IUS		IUS013	13	Unsicher zu sein bedeutet, dass ich nicht erstklassig bin	
IUS		IUS014	14	Wenn ich unsicher bin, kann ich den nächsten Schritt nicht tun	
IUS		IUS015	15	Wenn ich unsicher bin, funktioniere ich nicht gut	

## PARTIALLY REMOTE

- E-Mail to participant**  
*individualized link with query string containing project & participant id*

- Questionnaires @Home**   
*Socio-demographic variables first (everything else in randomized order)*





- Cognitive tests @Lab**   
*BACS, LNS, WCST (in randomized order)*


- |                    |                                      |
|--------------------|--------------------------------------|
| + standardization  | + experimenter costs                 |
| + forwarding       | -- No control about home environment |
| + data digitalized |                                      |
| + data centralized |                                      |

## LAB (ONLINE)



- Experimenter page**   
*Project, Participant-ID, Sample, Audio check, full screen check*  
**Instructions to participant**

- Cognitive tests**   
*BACS, LNS, WCST (in randomized order)*

- Questionnaires**   
*Socio-demographic variables first (everything else in randomized order)*

- |                    |                       |
|--------------------|-----------------------|
| + standardization  | + data centralized    |
| + forwarding       | + controlled environ. |
| + data digitalized | -- experimenter costs |

## LAB (OFFLINE)



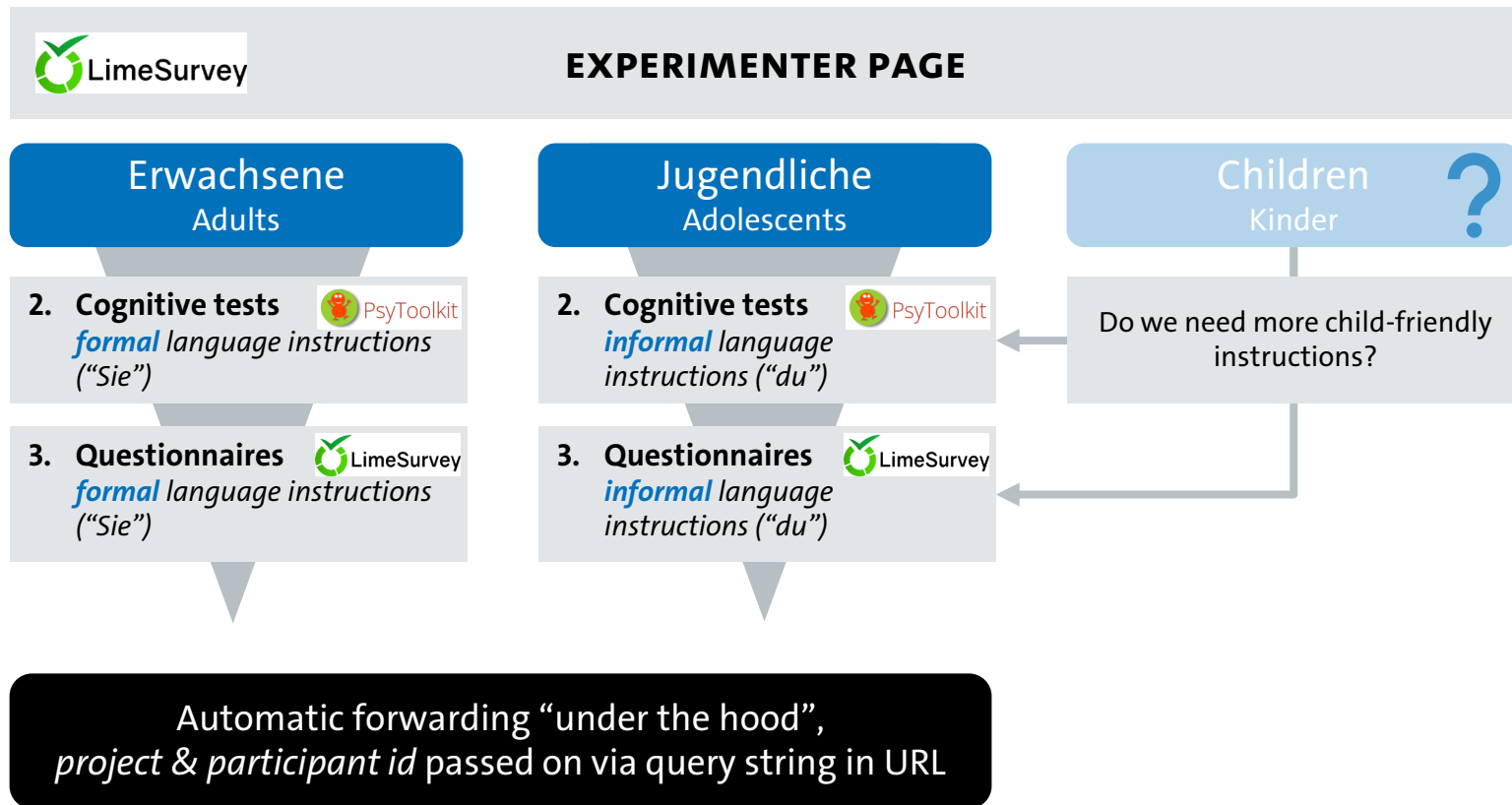
- Instructions to participant**  
*(printed)*

- Cognitive tests**  
*BACS, LNS, WCST (HTML files), randomization based on predetermined list (started separately by experimenter), data saved manually*

- Questionnaires**  
*Paper-pencil version (fixed order vs. pseudo-randomization)*

- |                                  |                        |
|----------------------------------|------------------------|
| + standardization                | -- Risk of data loss   |
| -- high experimenter involvement | -- Data locally stored |
|                                  | + Backup plan (?)      |

# BACKBONE VERSIONS



Version 2024-02-28

SOP Backbone

RU5389



## Assessment options

Participants can complete the Backbone in the **laboratory via online applications** or in an **offline** mode, or **partially remote** (questionnaires online from home). The cognitive tests must be assessed in the laboratory to ensure standardization.

## Laboratory (Online)



1	Preparation	5 min
	<b>Apparatus</b> <ul style="list-style-type: none"> <li>• Computer screen with 1920 × 1080 <u>px</u> resolution</li> <li>• Computer mouse + keyboard</li> <li>• Audio (boxes or headphones)</li> <li>• Internet connection</li> </ul> <b>Start Backbone</b> <ul style="list-style-type: none"> <li>• Open <a href="https://umfragen.uni-hamburg.de/ru5389bb">https://umfragen.uni-hamburg.de/ru5389bb</a></li> <li>• Provide information: project number, participant-id, <u>sample</u></li> <li>• Switch to full screen and confirm (by clicking “done”)</li> <li>• Check if audio works and confirm (by clicking “done”)</li> </ul>	
2	Administration	40-80 min
	<ul style="list-style-type: none"> <li>• Participants can complete the Backbone on their own, given that all instructions are displayed on screen, and they are automatically forwarded.</li> </ul>	

# ADMINISTRATION



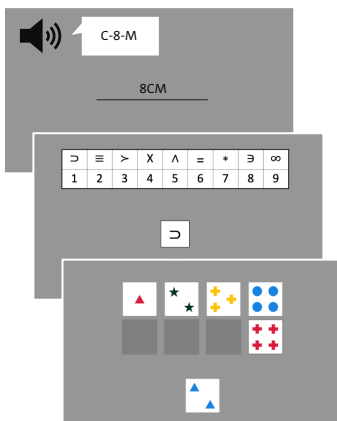
- When will the Backbone be administered in your project?
- Which assessment mode will be the default in your project?
  - @Lab (**online**)
  - @Lab (**offline**)
  - Partially remote (questionnaires @Home, cognitive tests @Lab)
- Which assessments/procedures will participants have completed before filling in the Backbone?
- Are there any (additional) specifics/special requirements to consider for your project? (e.g., P6: infants?)
- Questions, comments, thoughts?



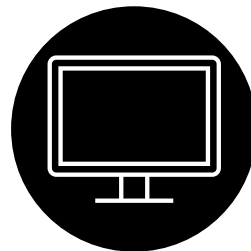
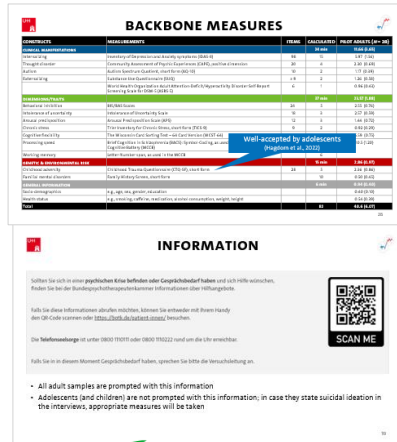
# BACKBONE SUMMARY



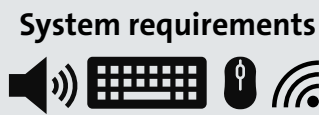
## COGNITIVE TESTS



## QUESTIONNAIRES

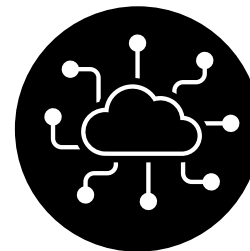


## COMPUTERIZED



**ID requirements**  
Identical format  
(Tests: "999")

- + standardization
- + efficiency
- cognitive test norms based on paper-pencil



## DATA CENTRALIZATION

**Data sharing requests**

**Analyses scripts**  
R Studio

<https://umfragen.uni-hamburg.de/ru5389bb>

# REFERENCES

## Aberrant DynBU in Psychopathology

- Bruckner, R., Heekeren, H. R., & Nassar, M. (2022). Understanding Learning Through Uncertainty and Bias The computational basis of following advice in adolescents View project. *Preprint*. <https://doi.org/10.31234/osf.io/xjkbq>
- Gagne, C., Agai, S., Ramiro, C., Dayan, P., & Bishop, S. (2022). Biased belief priors versus biased belief updating: Differential correlates of depression and anxiety. *PLOS Computational Biology*, 18(8), e1010176-e1010176. <https://doi.org/10.1371/journal.pcbi.1010176>
- Gibbs-Dean, T., Katthagen, T., Tsenkova, I., Ali, R., Liang, X., Spencer, T., & Diederer, K. (2023). Belief updating in psychosis, depression and anxiety disorders: A systematic review across computational modelling approaches. *Neuroscience & Biobehavioral Reviews*, 147. <https://doi.org/10.1016/j.neubiorev.2023.105087>
- Katthagen, T., Fromm, S., Wieland, L., & Schlagenhauf, F. (2022). Models of Dynamic Belief Updating in Psychosis — A Review Across Different Computational Approaches. *Frontiers in Psychiatry*, 13, 814111-814111. <https://doi.org/10.3389/FPSYT.2022.814111>
- Lawson, R. P., Mathys, C., & Rees, G. (2017). Adults with autism overestimate the volatility of the sensory environment. *Nature Neuroscience*, 20, 1293-1299. <https://doi.org/10.1038/nn.4615>
- Nassar, M. R., & Troiani, V. (2021). The stability flexibility tradeoff and the dark side of detail. *Cognitive, Affective, & Behavioral Neuroscience*, 21, 607-623. <https://doi.org/10.3758/s13415-020-00848-8/Published>
- Nassar, M. R., Waltz, J. A., Albrecht, M. A., Gold, J. M., & Frank, M. J. (2021). All or nothing belief updating in patients with schizophrenia reduces precision and flexibility of beliefs. *Brain*, 144, 1013-1029. <https://doi.org/10.1093/brain/awaa453>

# REFERENCES

## **Hierarchical Taxonomy of Psychopathology (HiTOP)**

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## **Risk factors in psychopathology**

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