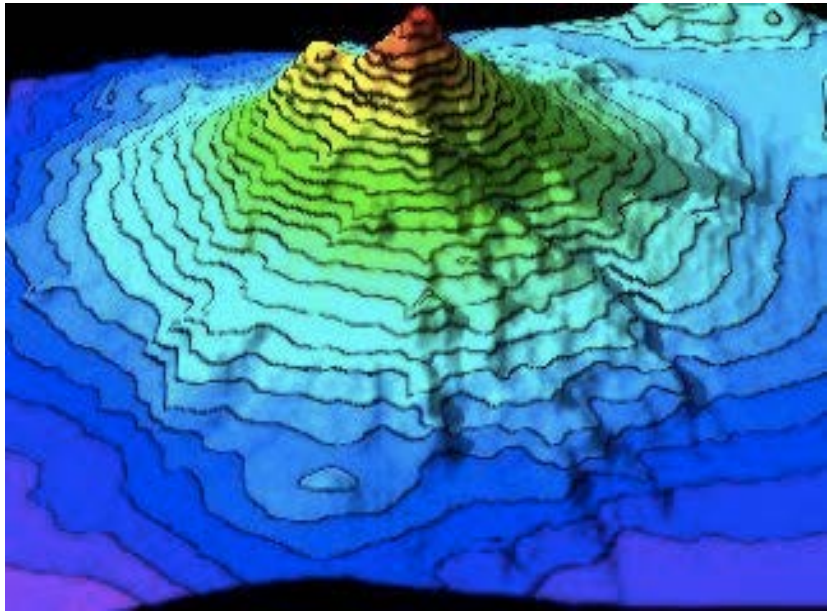
Hearing the Voice:
Exploring the Phenomenology, Cognition, and Neuroscience of Non-Clinical Hallucinatory Experiences

Ben Alderson-Day
Durham University

SPRIG Seminar
University of Sussex
November 28th 2018

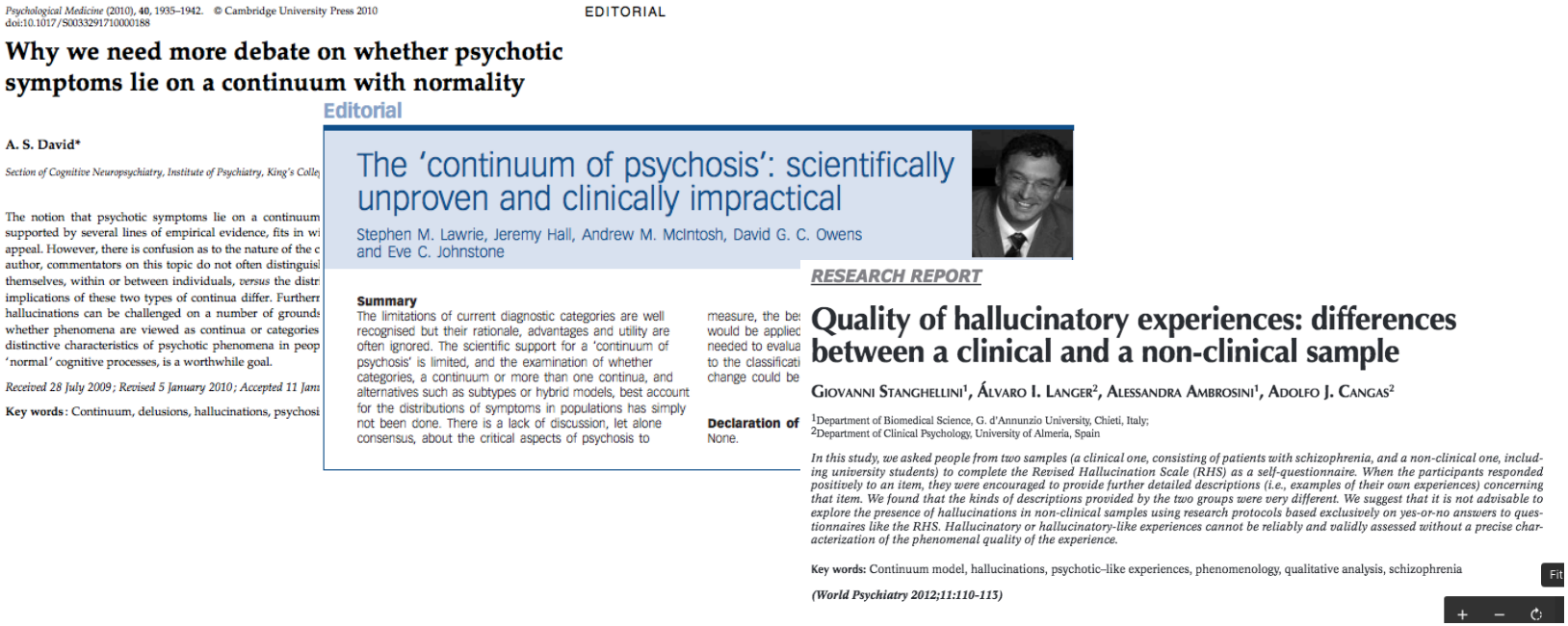
Hearing the Voice (2012-2020)

Interdisciplinary study of auditory verbal hallucinations



Often working with people who

- reject mental health services
- are members of Hearing Voices Movement
- haven't **needed** to use mental health services.
- may have spiritual interpretations of their experiences



Psychological Medicine (2010), **40**, 1935–1942. © Cambridge University Press 2010
doi:10.1017/S0033291710000188

EDITORIAL

Why we need more debate on whether psychotic symptoms lie on a continuum with normality

A. S. David*

Section of Cognitive Neuropsychiatry, Institute of Psychiatry, King's Colle

The notion that psychotic symptoms lie on a continuum supported by several lines of empirical evidence, fits in wi appeal. However, there is confusion as to the nature of the c author, commentators on this topic do not often distinguis themselves, within or between individuals, *versus* the distr implications of these two types of continua differ. Further hallucinations can be challenged on a number of ground whether phenomena are viewed as continua or categories distinctive characteristics of psychotic phenomena in peop 'normal' cognitive processes, is a worthwhile goal.

Received 28 July 2009; Revised 5 January 2010; Accepted 11 Jan

Key words: Continuum, delusions, hallucinations, psychosi

Editorial

The 'continuum of psychosis': scientifically unproven and clinically impractical

Stephen M. Lawrie, Jeremy Hall, Andrew M. McIntosh, David G. C. Owens and Eve C. Johnstone

Summary

The limitations of current diagnostic categories are well recognised but their rationale, advantages and utility are often ignored. The scientific support for a 'continuum of psychosis' is limited, and the examination of whether categories, a continuum or more than one continua, and alternatives such as subtypes or hybrid models, best account for the distributions of symptoms in populations has simply not been done. There is a lack of discussion, let alone consensus, about the critical aspects of psychosis to measure, the be would be applied needed to evalua to the classificati change could be

Declaration of

None.

RESEARCH REPORT

Quality of hallucinatory experiences: differences between a clinical and a non-clinical sample

GIOVANNI STANGHELLINI[1], ÁLVARO I. LANGER[2], ALESSANDRA AMBROSINI[1], ADOLFO J. CANGAS[2]

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In this study, we asked people from two samples (a clinical one, consisting of patients with schizophrenia, and a non-clinical one, including university students) to complete the Revised Hallucination Scale (RHS) as a self-questionnaire. When the participants responded positively to an item, they were encouraged to provide further detailed descriptions (i.e., examples of their own experiences) concerning that item. We found that the kinds of descriptions provided by the two groups were very different. We suggest that it is not advisable to explore the presence of hallucinations in non-clinical samples using research protocols based exclusively on yes-or-no answers to questionnaires like the RHS. Hallucinatory or hallucinatory-like experiences cannot be reliably and validly assessed without a precise characterization of the phenomenal quality of the experience.

Key words: Continuum model, hallucinations, psychotic–like experiences, phenomenology, qualitative analysis, schizophrenia

(World Psychiatry 2012;11:110-113)

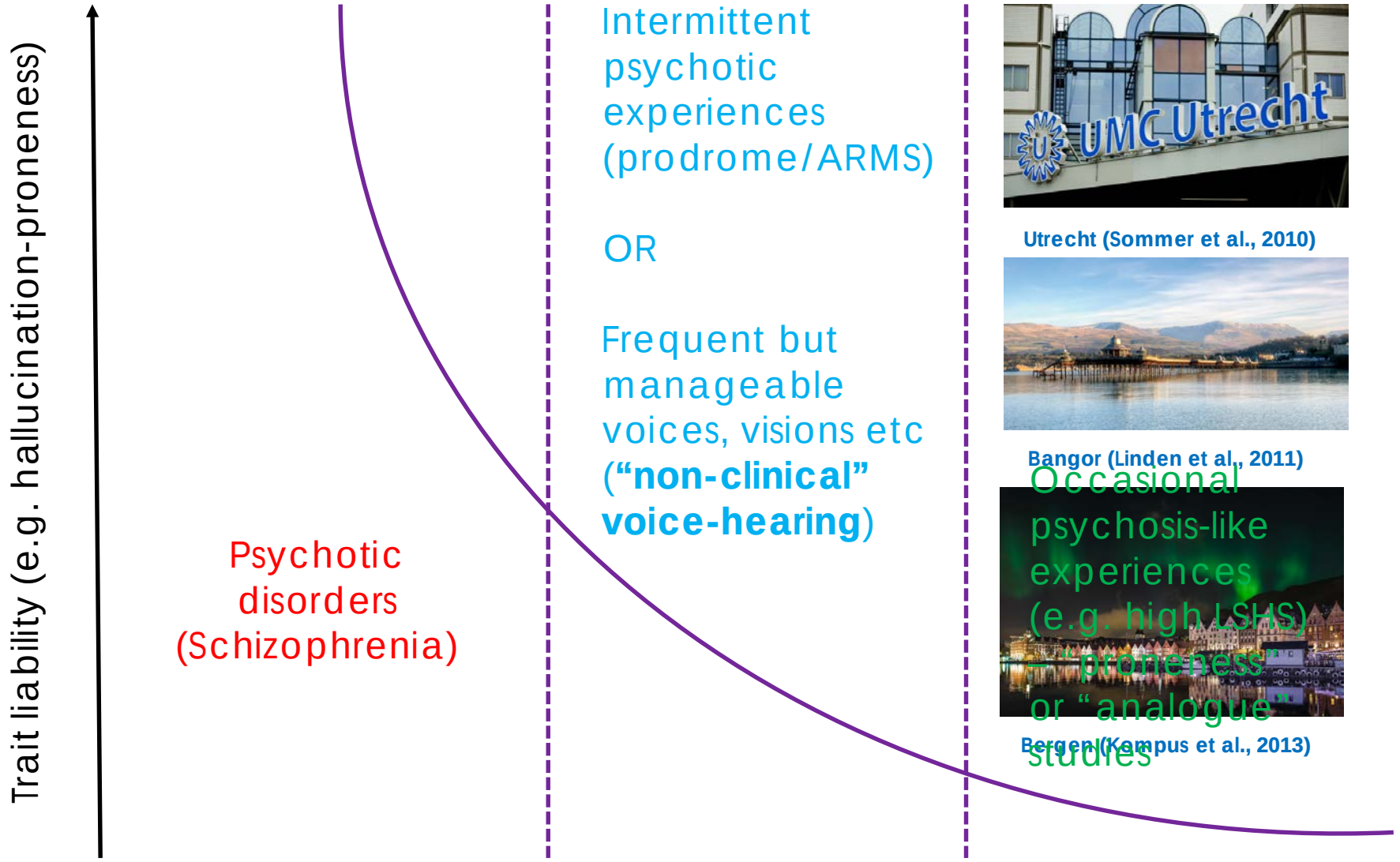
A continuum of …what exactly?

Phenomenology?

Cognition?

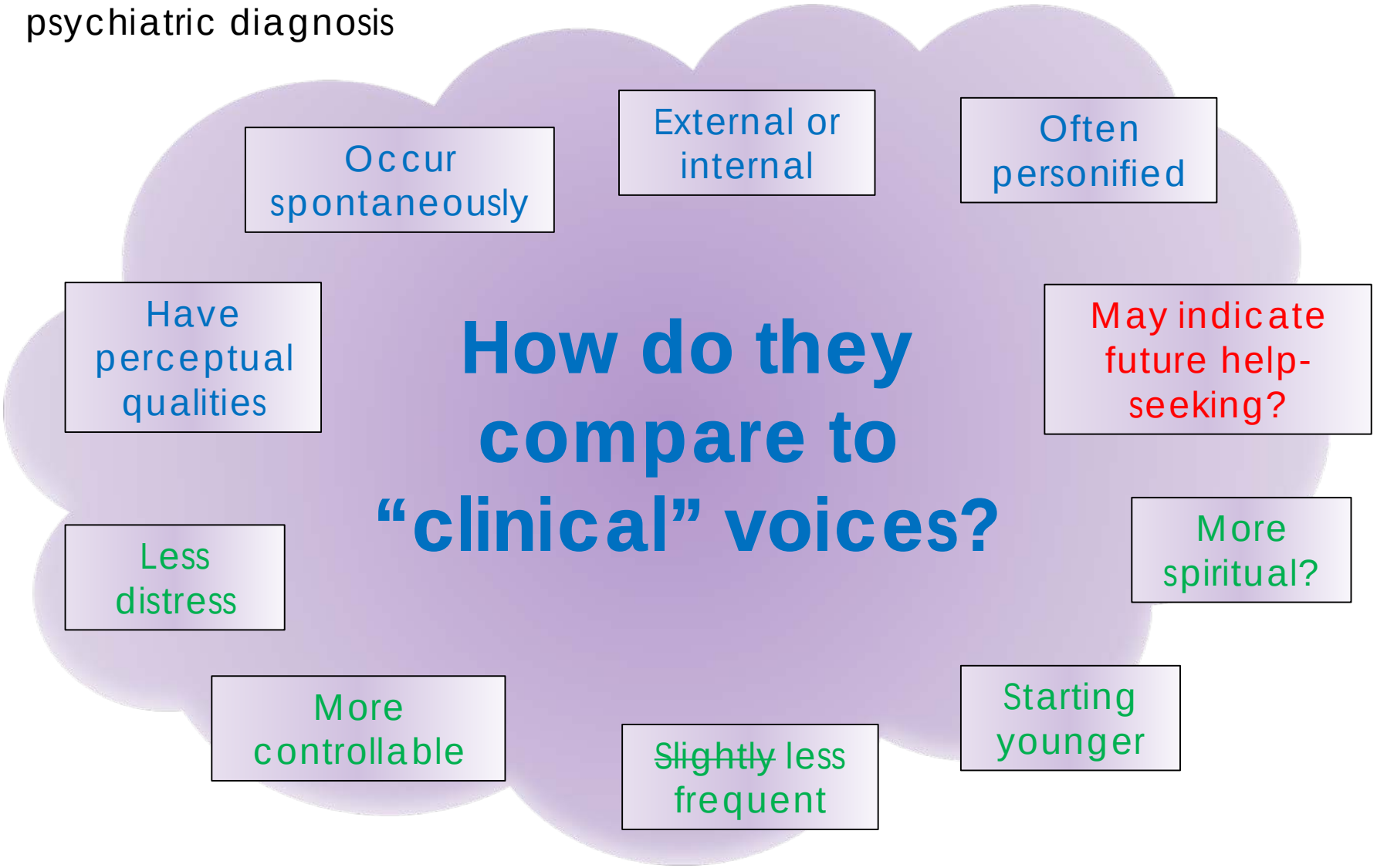
Neurophysiology?

Psychotic experiences as continuous traits



1. Phenomenology

- **Non-clinical voice-hearers:** Hearing voices *at least once a month* & no psychiatric diagnosis



Honig et al. (1998); Leudar et al. (1997), Daalman et al., (2011); Krakvik et al. (2015); Woods et al., (2015); Peters et al., (2016); Powers et al., (2017); Daalman et al., (2016)

A matter of interpretation?
(e.g. “UNIQUE” sample; Peters et al., 2017, cf. Woods & Wilkinson, 2017, *Lancet Psych.)*

Name/term for voice	Interpretation
The ‘entity’	An evil spirit sent to tempt and distract from God
‘Brain radio’	Unconscious brain processes?
A guide or friend	Don’t know – don’t care!
‘Them’	Beings from another dimension
Spirits/The dead	Enduring spirits of loved ones
Messages/communications	Tuning into non-verbal signals from living entities
Spirit/energy	Extrasensory communication with sprits
God, demons, Reason	Multiple entities in spiritual realm

From sample in Alderson-Day, Lima et al., (2017, *Brain*)

Strange but True

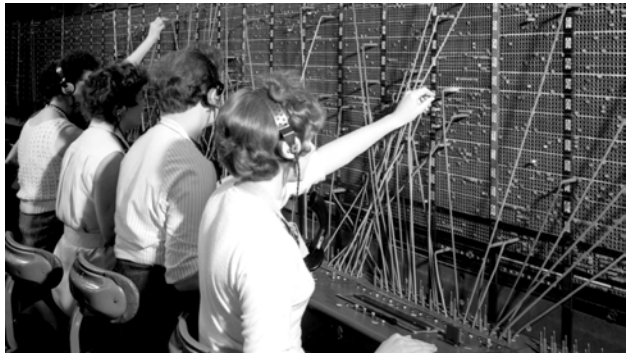
- Spiritualist & mediumistic beliefs **common** in non-clinical samples. How much does the phenomenology really overlap? *(Powers et al., 2016, c.f. Luhrmann, 2017)*

- **HtV Spiritualism study** (2016 – present) led by Peter Moseley
  - Specific recruitment via SNU (i.e. not just "non-clinical")
  - Phenomenological assessment (n = 30); coding ongoing by interdisciplinary team
  - Cognitive and fMRI battery
  - Same protocols for 3 year longitudinal study of voice-hearers in EIP services

Pete Moseley

Adam Powell

Same or different?



- Similarities: Auditory qualities, personification, changes in agency, internality and externality….
- Striking differences in **voice identity**

  "Depends on the spirit – different every time"

  "It's not for me, it's for the recipient"

  "Boom! And on to the next one"

  "You're just the conduit"

The Representation of Agents in Auditory Verbal Hallucinations

SAM WILKINSON AND VAUGHAN BELL

Abstract: Current models of auditory verbal hallucinations (AVHs) tend to focus on the mechanisms underlying their occurrence, but often fail to address the content of the auditory experience. In other words, they tend to ask why there are AVHs at all, instead of asking why, given that there are AVHs, they have the properties that they have. One

PSYCHOSIS
2018, VOL. 10, NO. 2, 132–141
https://doi.org/10.1080/17522439.2018.1469037

Routledge
Taylor & Francis Group

Check for updates

Relating Therapy for distressing voices: Who, or what, is changing?

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[c]Department of Philosophy, Durham University, Dur

Voice-hearers with psychosis

Spiritualists

“Non-clinical” VH

Tulpamancers (2018-)

Writers’ Inner Voices (EIBF, 2014-2018)

John Foxwell

2. Cognition

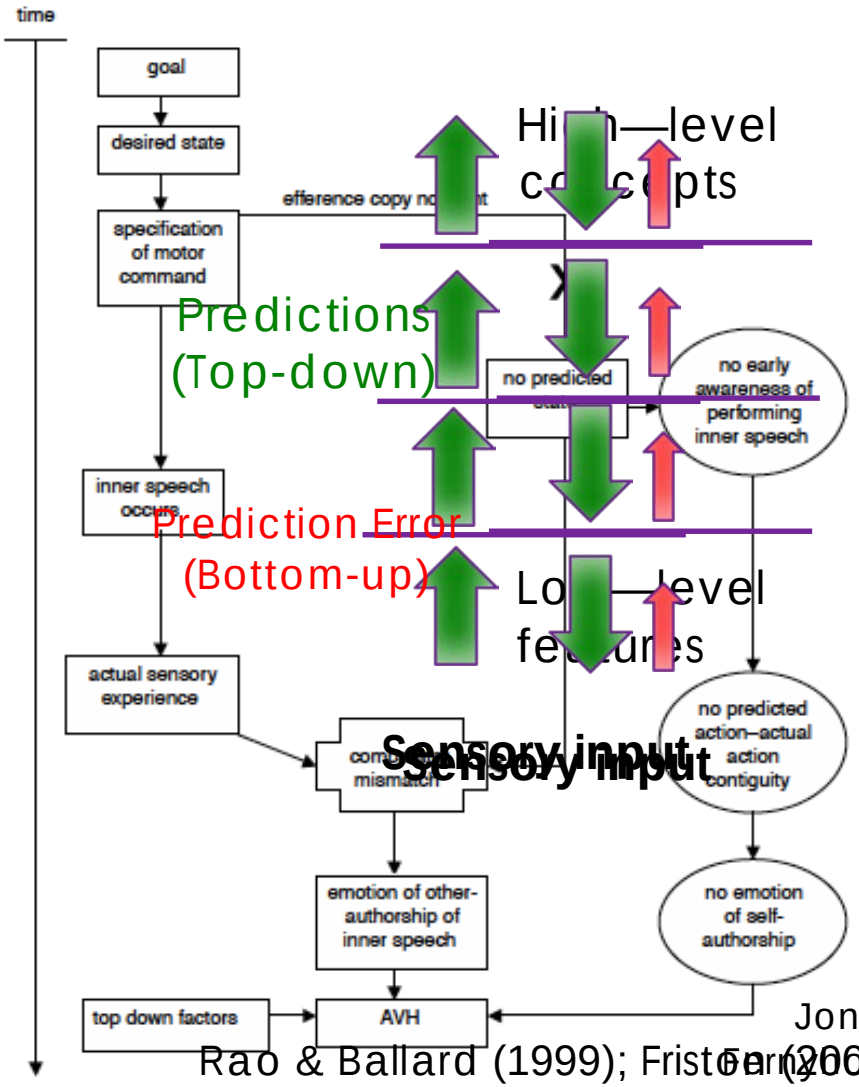
Models

- **Source monitoring framework**

  Thoughts and actions are **misattributed** to others in psychosis due to self-monitoring/externalising bias/disruptions to internal predictive models of self.

- **Predictive processing framework**

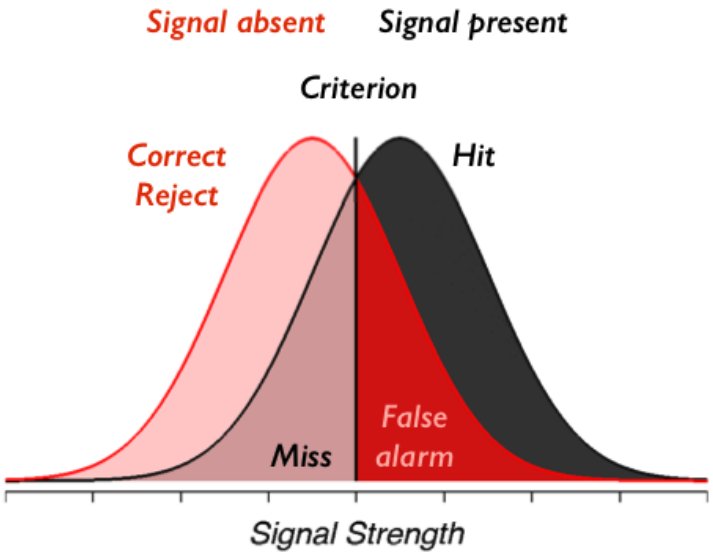
  Unusual models of the world develop from disruption to **updating** of prior beliefs/expectations and/or **atypical influence** of prior beliefs/ expectations on perception



Rao & Ballard (1999); Friston (2005); Jones & Fernyhough (2007), Clark (2013); Howhy (2014)

Measures

Auditory Signal Detection Tasks
(bias to identify speech, *b*, linked to hallucinations)



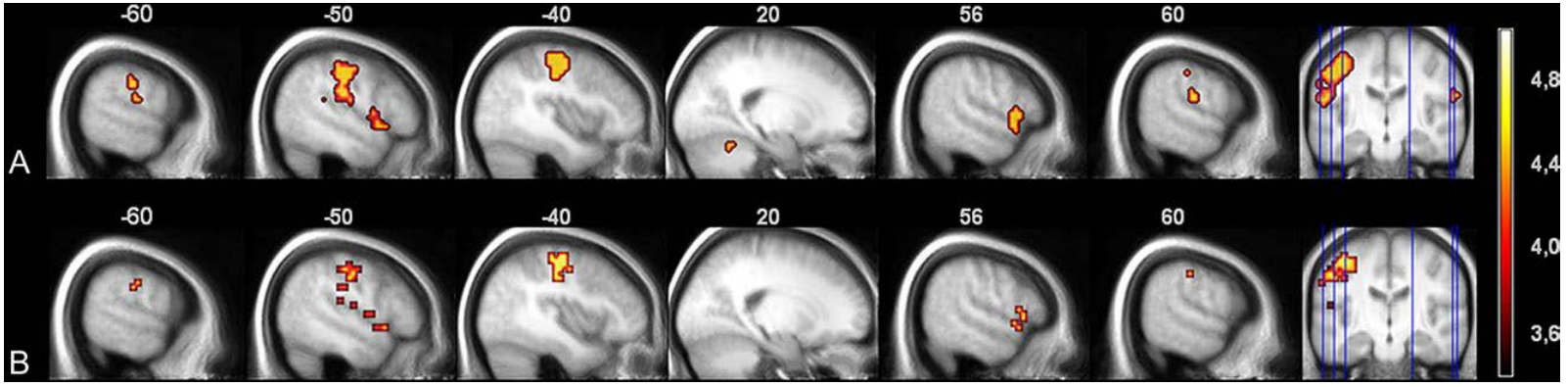
Source Memory Tasks
(self-other errors linked to hallucinations)

Cognition& hallucination-proneness

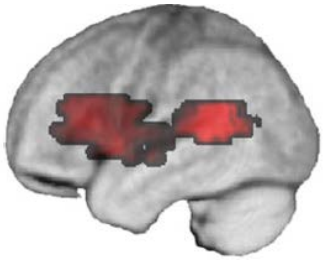
Process	Continuum evidence?
Signal detection	**Yes** for self-generated imagery (Moseley et al., 2014, *Neuropsychologia*) **Yes** for adults with history of imaginary friends (Fernyhough, Watson, et al., in prep) **Yes** for adults with history of homelessness (Rebecca Lee MSc project)
Source memory	**No** in two separate student samples (Garrison et al., 2017, *Cortex*) **No** across a wide age range (Thompson & Hallas MSc project) **Yes** for homelessness (Rebecca Lee MSc project)
"Intentional" inhibition	**Yes** in a student population (Alderson-Day, Moffatt et al., *Cortex*, revisions requested)
Agent perception	**Yes** for snap personality judgements of voices (Mitrenga et al., in prep.) **Yes** for detection of faces and eye gaze (Stucke et al., 2018)

Coming soon: Multisite 1 (14 labs worldwide testing 800+ people)

3. Neuroscience



Utrecht cohort

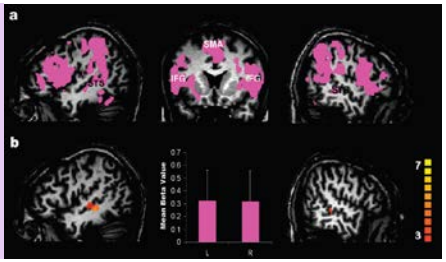


Speech processing networks (IFG, STG) implicated in symptom capture (Diederen et al., 2012); resting-state (Diederen et al., 2013; Van Lutterveld et al., 2014), DTI (De Weijer et al., 2013)

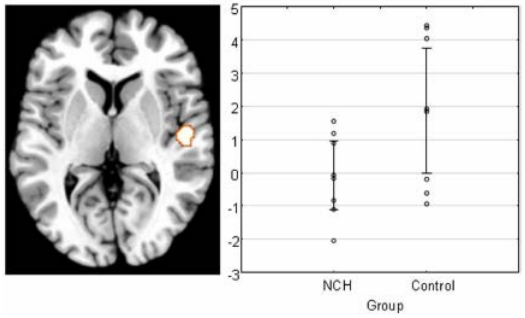
No shortening of paracingulate sulcus (related to reality monitoring & hallucinations; Garrison et al., 2018)

Bangor cohort

Speech & imagery regions implicated during symptom-capture (IFG, STG/STS, SMA; Linden et al., 2011)



Bergen cohort



Typical auditory attention but **atypical right PAC response** (Kompus et al., 2013)

Few studies testing both cognitive and neural mechanisms of hallucination

Science
AAAS

NEUROSCIENCE

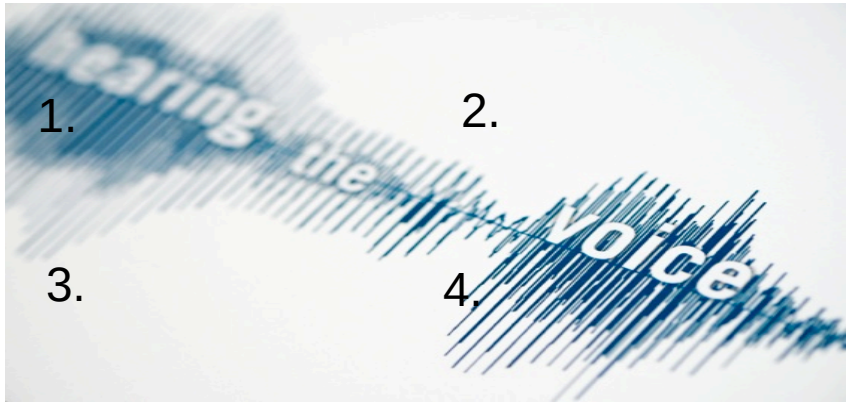
Pavlovian conditioning–induced hallucinations result from overweighting of perceptual priors

A. R. Powers,[1] C. Mathys,[2,3,4] P. R. Corlett[1]*

Some people hear voices that others do not, but only some of those people seek treatment. Using a Pavlovian learning task, we induced conditioned hallucinations in four groups of people who differed orthogonally in their voice-hearing and treatment-seeking statuses. People who hear voices were significantly more susceptible to the effect. Using functional neuroimaging and computational modeling of perception, we identified processes that differentiated voice-hearers from non–voice-hearers and treatment-seekers from non–treatment-seekers and characterized a brain circuit that mediated the conditioned hallucinations. These data demonstrate the profound and sometimes pathological impact of top-down cognitive processes on perception and may represent an objective means to discern people with a need for treatment from those without.

Powers et al., 2017

Priors for what though?



What do they sound like to you?

"*The house has nine rooms*"

"*The clown had a funny face*"

In sine-wave speech (and other degraded signals), **prior knowledge and expectation of speech** facilitate perception

- Do voice-hearers show an advantage on this?

What we did

Intelligible

Unintelligible

"Target"
(only ever unintelligible)

Pre-scan training
3 "scratchy" target
sour
sound

MRI Run 1
Participants scanned
listenin
SWS, ii)
iii) t

Halftime
Did they notice any speech? If so, when*?

Traini

MRI Run 2
Exactly th

Post-scan task
Can participants discriminate speech? Can they understand it?

* Participants saw 6 **visual markers** to divide up each run (block 1, block 2 *etc*)

Predictions

- If top-down influences on speech perception = greater in voice-hearers, they should be **better** at noticing language in sine-wave speech, e.g.
  - Earlier **detection** (an ability to spontaneously hear speech) or
  - Enhanced **discrimination** once they have new knowledge
  - Any specific effect should be reflected in the neural response

Behavioural Results

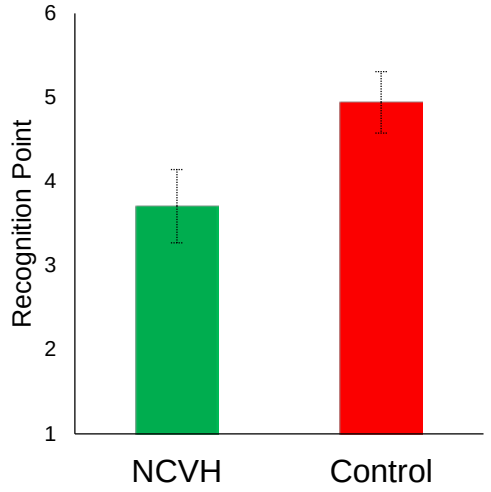
Before the scan... no-one guessed it was speech.

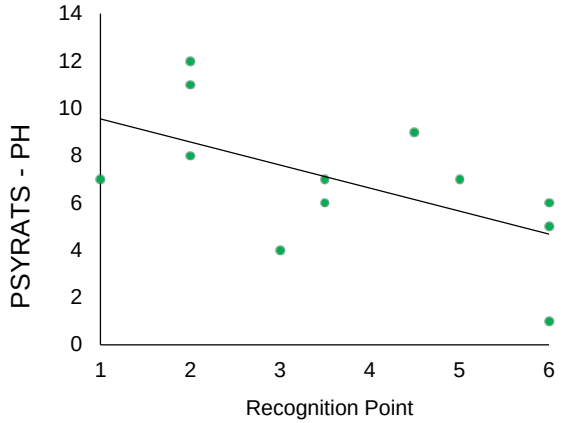
During the scan

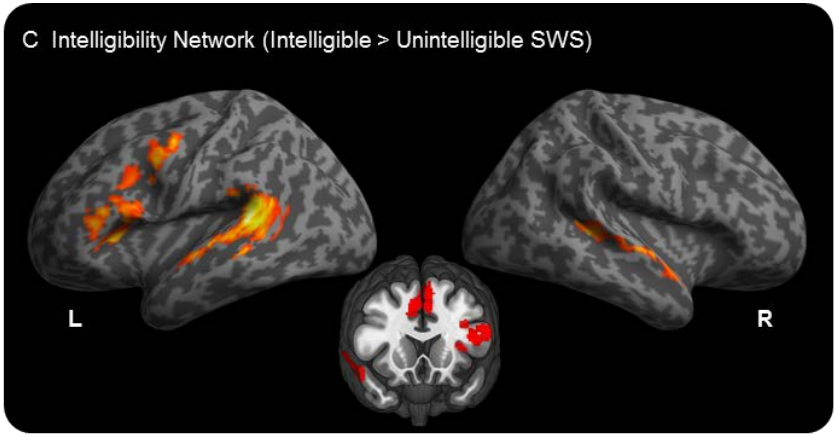
- 75% voice-hearers vs 47% realised speech present sometime in run 1
- Voice-hearers noticed significantly ***earlier*** & this correlated with hallucination severity (PSYRATS items 1-4, r = -.582,p = .047)

After the scan

- No differences in discrimination of speech (nor bias, or keyword accuracy)



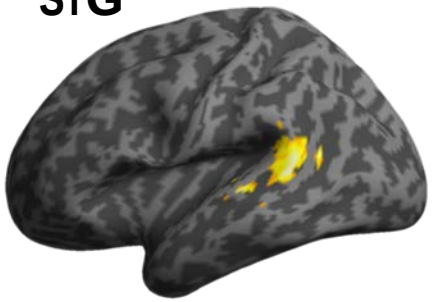


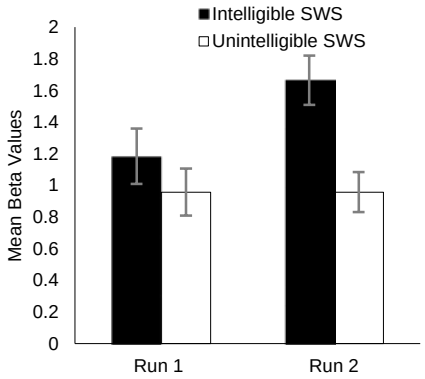


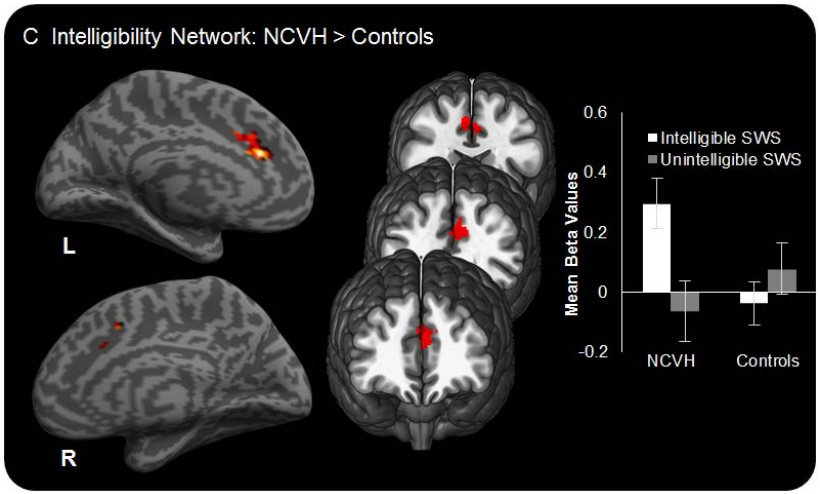
fMRI results

1. Overall, both groups activate left fronto-temporal speech network (all p_{FWE} <.05, whole-brain corr.)

2. Change from run 1 to run 2 (both groups): **left STG**



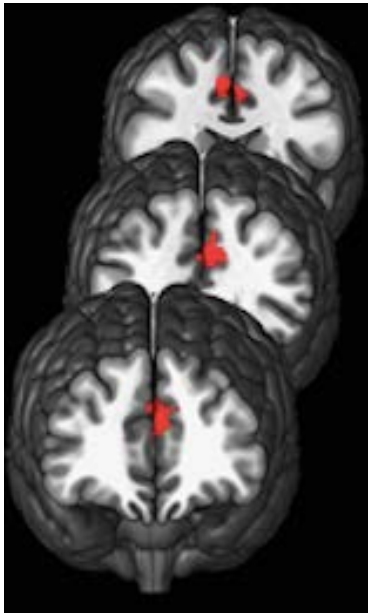




3. Group difference in **dorsal anterior cingulate cortex**; no differences in speech-specific regions or primary auditory cortex

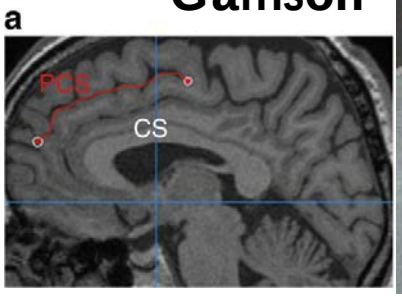
Alderson-Day, Lima et al.(2017) *Brain.* All images FWE-corr. P <.05, cluster-level

- **Dorsal anterior cingulate cortex** (dACC) involved in lots of things….
  - response selection & conflict monitoring (Ebitz & Hayden, 2016); attention allocation (Benedict et al., 2002); modifying predictions (Jahn et al., 2014)
  - Alongside resting activity in auditory cortex (Hunter et al., 2006); in hypnosis-induced AVH (Szechtmann et al., 1998); early symptom capture studies (Shergill et al., 2001); monitoring sound in psychics (Powers et al., 2017)

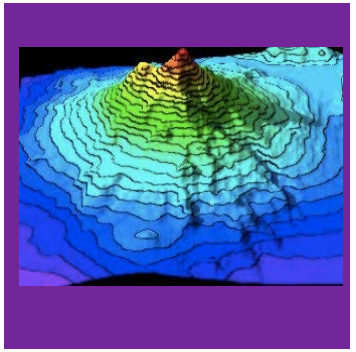


- Structural differences in **paracingulate sulcus**
  - Non-clin. voice-hearers show atypical lateralisation of PCS length (right > left) – very unusual!
  - Correlates with recognition point for SWS & voice-hearing in previous week….

Jane Garrison



*(*Garrison et al, 2015, *Nature Comms)*



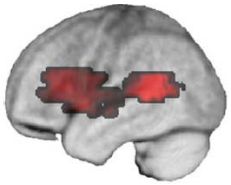
Summary

What do we see when we explore voice-hearing & hallucinations across "the continuum"?

- **Phenomenological diversity** – no single "non-clinical" population: similarities for perception, agency – but different agents?

- **Cognitive fractionation** –some processes continuous; perception and inhibition track hallucination-proneness, source memory linked to clinical status/adversity

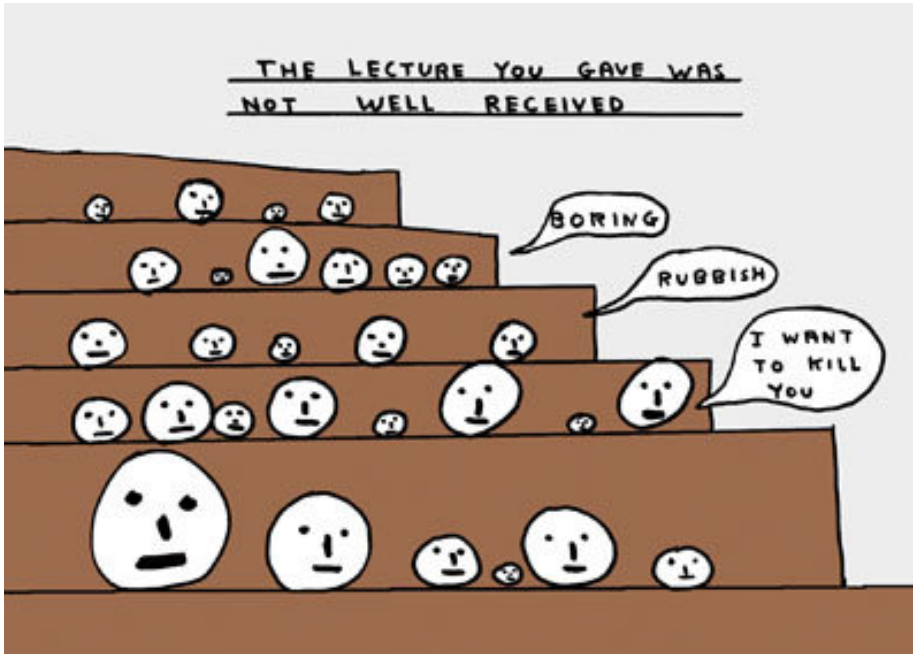
- **Neural continuity?** Similar networks & potentially similar mechanisms underlying voice-hearing & influence of expectations… but differences *between* non-clinical groups?



~~*A* continuum?~~

Continuities & discontinuities

Thanks for listening



UNIQUE

@aldersonday @hearingvoice

Who were our participants?

Table 1 Demographic & clinical characteristics

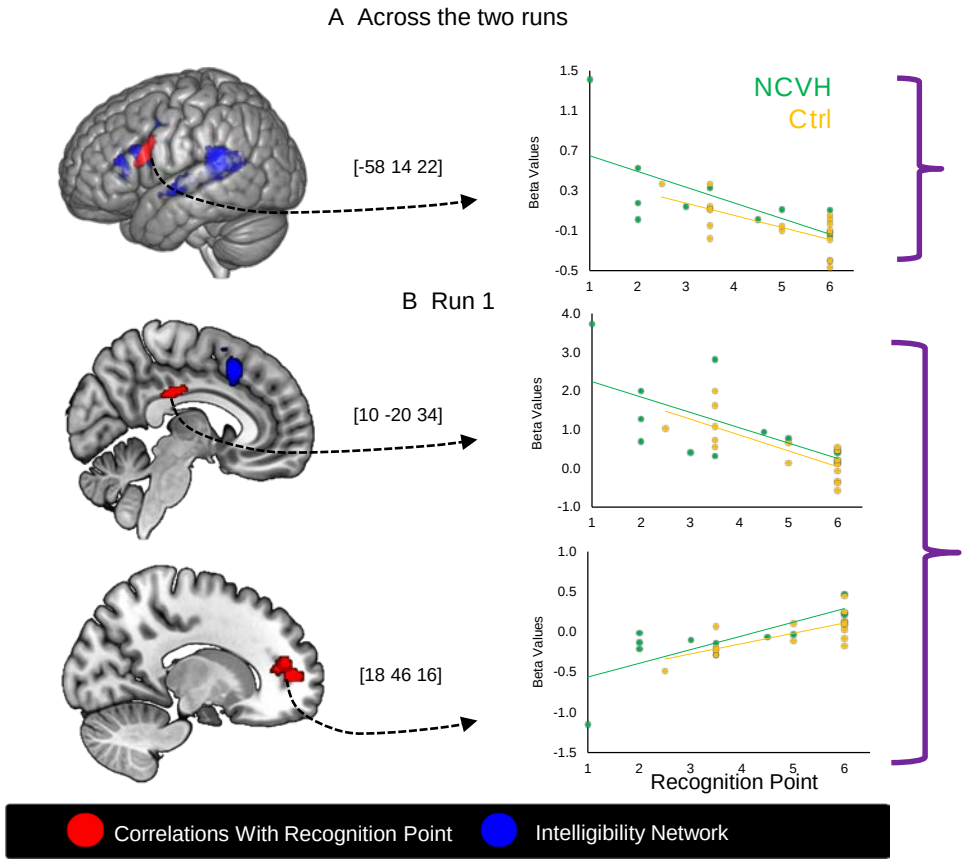
	NCVH		Control		*p*
Sex	8F/4M		12F/5M		0.822
Hand	11R/1L		14R/3L		0.474
	M	*SD*	*M*	*SD*	
Age (years)	44.58	14.73	42.47	14.40	0.70
Education (years)	19.08	4.81	18.88	3.12	0.89
NART (max.50)	38.92	3.80	38.47	8.65	0.85
PSYRATS-AH Total	13.17	4.41			
PSYRATS-AH 1-4 Interview	7.83	2.66			
PSYRATS-AH 1-4 Scanning	6.92	2.97			
PANSS-P	13.08	1.98			
PANSS-N	8.00	0.95			
P1 Delusions	2.33	0.78			
P3 Hallucinations	4.00	0.60	-	-	-

NCVH = Non-Clinical Voice-Hearers; NART = National Adult Reading Test; PSYRATS-AH = Psychotic Symptoms Rating Scale- Auditory Hallucinations; PANSS = Positive & Negative Syndrome Scale (P – Positive, N- Negative), P1 & P3 indicate individual PANSS items

Similar to Utrecht (Daalman et al.,2011)

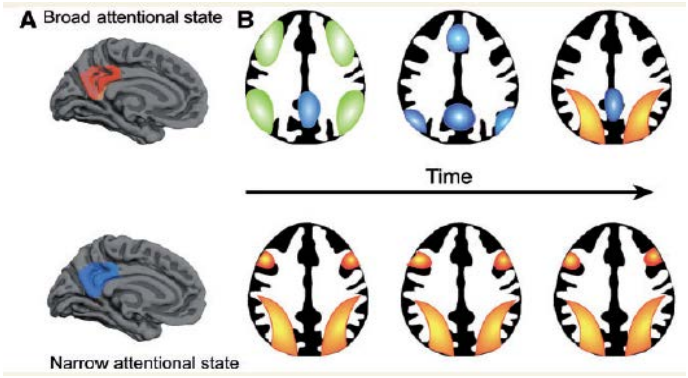
Similar to Bangor (Linden et al., 2011)

Individual differences in recognition point (when people report noticing speech)



Left IFG & premotor cortex: top-down effects on speech perception (e.g. Davis & Johnsrude, 2003)

Middle/Posterior cingulate cortex: maintaining a broad attentional state? (Leech & Sharp, 2013)



Alderson-Day, Lima et al.(2017) *Brain.*
All images FWE-corr. P <.05, cluster-level

Arousal, Balance and Breadth of Attention model (ABBA)