Language in psychosis

Chantal Murthy

Why does examining *language* in psychosis matter...

- Language is a medium of social relating. Differences in the use of language by people with psychosis can make it harder for them to be understood (1)
- Language is important for ratings of therapeutic contact (2)
- *Language can index psychopathological differences that show up well before first-episode symptoms of psychosis* (3)
- *Language in psychosis is more likely to reflect disruptions in thought processes rather than the idiosyncratic or foreign nature of the language itself.* (4)
- But also.. ***Language may be the only way the person knows to relay their potentially cacophonic and distressed interior*** **(subjective)**

1. Achim, A. M., Roy, M. A., & Fossard, M. (2023). The other side of the social interaction: theory of mind impairments in people with schizophrenia are linked to other people's difficulties in understanding them. Schizophrenia Research, 259, 150-157.
2. Cavelti, M., Homan, P., & Vauth, R. (2016). The impact of thought disorder on therapeutic alliance and personal recovery in schizophrenia and schizoaffective disorder: An exploratory study. Psychiatry research, 239, 92-98.
3. Bedi, G., Carrillo, F., Cecchi, G. A., Slezak, D. F., Sigman, M., Mota, N. B., ... & Corcoran, C. M. (2015). Automated analysis of free speech predicts psychosis onset in high-risk youths. npj Schizophrenia, 1(1), 1-7.
4. Kuperberg, G. R. (2010). Language in schizophrenia part 1: an introduction. Language and linguistics compass, 4(8), 576-589.

How I experience language in my brain

*I “translate” my originally described phenomena to easier to understand language. I also acknowledge this may compromise *meaning*. I encourage to read and process the raw excerpts if you have time.

I order these based on intuition from *most* prevalent to *least* in the general population (including non clinical samples)

General cognitive interference when trying to focus/recall info

“noticing more cognitive interference -- say when I try to recall details about the confidence intervals I hear some fragments of song in my head. So let's try again. Words come in, like ‘prototypical, Acheulean, Neanderthalic’, from a lecture I watched a few hours back, coming into my head. really smart. Jolts to a song with ‘lalala i just can't get you out of my head’...jumps back to the thread..”confidence intervals endpoints are stochastic, in the frequentist scenario”.. From all this I realize, the human mind is not designed to have catchy tunes in the head, along with recollections about the possibly affective stance of a person experiencing the same situation that we are, all at the same time we are trying to process the information in a situation..? that this is a limitation of the human mind that no one can explain well..”

"I have intrusions while I'm trying to learn statistics featuring random music or details from a lecture I watched about ancient humans. My mind jumps back and forth between these topics. I come to the frustrating realization that my mind isn't designed to handle such a high level of parallel processing across very different contexts."

General associativity (not including when my own thoughts' shapes are used as associative cues, aka **no 'metacognitive' observer causing the excessive associativity**)

"As I flicked my wrist in a direction I heard a tap in my head -> the wrist flick was in the direction of my phone and so I checked some messages -> something about the idea of checking messages reminded me of a song I liked -> I remembered a past context I heard the song in -> thoughts jumped to seeing a car outside with two bumps and thought of mickey mouse -> saw a flashback of an old 90s style mickey mouse outfit -> remembered where i had seen such an outfit on the bottom of a potpourri container, at my old house -> this reminded me of my old house where there was a moth on the wall that scared me -> i saw an imaginary moth in my mind's eye open its wings and saw golden circles on their wings -> i was swept into the circle and was reminded of the movie The Ring"

"Sounds in my environment, along with the songs they trigger as memory cues and the visuals associated with them, can put me into a hyper-associative mode of processing."

Excessive meta-cognitive associativity (of thought content, associated emotion, or my own affect)--leading to **excess perspective switching**

“to make this more clear, what happens to me at least is a reverse mirroring process: i start to notice my own mental state like “chantal is reading a sentence of a book”..much like many other people have read things and focused, but the fact that she becomes aware of other people having that same mental experience makes her own previously pristine experience muddled”

"My own facial expression becomes a memory or imaginative trigger that brings up images of other people who have made the same face. Remembering these people can then shift my current experience."

Oscillation of **over-sensory** states **with thought-disordered** states

Both of these states were reported to have occurred within the span of days, by my report. The first state was substance induced (15-30 mg CBD (Cannabidiol), also replicated under *just one session* of Brainsway Deep TMS (Transcranial Magnetic Stimulation) therapy on mPFC-ACC while the second was my baseline at the time.

“**In one state:** I am abnormally sensory sensitive, hyperfocused, have no thought disorganization whatsoever, am emotionally more irritable and lacking any awareness of people even around me. I'm having lots of a "drivenness to action" of the mania-sort, with relative sharpness and clear headedness, that combined, makes me really want to *feel* the contours of understanding arguments as precisely as I can
In a 'opposite' state: I'm "disorganized" states, with proto words and images, a-grammatical sentences in my head along with rapid perspective shifting (feelings of viewing myself from the perspectives of many other people and having a psychic war of sorts).”

"I can be quite sensitive to treatments. Just a small amount of CBD or mPFC-ACC TMS, in a short period of time, made me overly attuned to my sensory environment–far from my usual thought-disordered baseline."

Examples of how researchers study language in psychosis

*Please keep in mind there is a lot of research in this area, and I'm only highlighting a small fraction of what's out there!

How to study language production differences in psychosis - **Quantitative Methods in Computational/Psycholinguistics**

- **Acoustic analysis**
  - Matt Goldrick et. al's work (1) mentions a feature indexing variability in *voice onset times* in clinical populations
- **Lexical analysis**
  - Gina Kuperberg's paper (2) that mentions features of 1) number of associations and 2) *predictability* vs *variability* of words, within a unit of time in speech
    - ***High*** number of associations and ***low*** predictability: "The window of her mind opened, and out flew a kaleidoscope of unspoken memories."
    - ***High*** number of associations and ***high*** predictability: "Freedom is the foundation of democracy."

1. Hitczenko, K., Segal, Y., Keshet, J., Goldrick, M., & Mittal, V. A. (2023). Speech characteristics yield important clues about motor function: Speech variability in individuals at clinical high-risk for psychosis. Schizophrenia, 9(1), 60.
2. Kuperberg, G. R. (2010). Language in schizophrenia part 1: an introduction. Language and linguistics compass, 4(8), 576-589.

How to study language production differences in psychosis - **Quantitative Methods in Computational/Psycholinguistics**

- **Semantic analysis**
  - Gina Kuperberg's paper (2) that mentions a feature indexing the ability to resolve *lexical ambiguity* - aka level to which context biases interpretation of a word away from its "default" meaning
    - **Person hears**: "Before we launch the new product, we need to get all our ducks in a row—legal, design, marketing. Everything needs to align."
    - But person is instead thinking about ponds, swimming, geese..
- **Structural analysis**
  - Gina Kuperberg's papers (1/2) that mentions features indexing 1) the use of *vague* or *confused references*, such as pronouns referring to multiple things, references pointing to things in multiple points in time and space and 2) ratio of *propositional meaning* to *semantic associative meaning* within discourse
    - **Mixture of vague and confused references**: "She told me last week about what's going to happen next year or quarter, and now I think we did that already, which might be the same as what they'll do. It's all about time managers and accountants"
    - **Propositional vs semantic associative meanings:**
      - "The chair has four legs, each made from oak wood. It was assembled in a factory in Michigan two years ago, and the fabric covering the seat is a durable polyester blend. The chair has a weight limit of 300 pounds and is designed to last for approximately 10 years with regular use."
      - vs "The chair has four legs, as do dogs, cows, farm animals, it's what binds life together, legs, uniting the world in harmony brotherhood"

1. Kuperberg, G. R. (2010). Language in schizophrenia part 1: an introduction. Language and linguistics compass, 4(8), 576-589.
2. Kuperberg, G. R. (2010). Language in schizophrenia Part 2: What can psycholinguistics bring to the study of schizophrenia... and vice versa?. Language and linguistics compass, 4(8), 590-604.

How to study language production differences in psychosis - **Quantitative Methods cont'd**

- **Electrophysiology**
  - Gina Kuperberg et. al's work (1) on fast automatic spreading of neural activity in relation to deficient **N400 response**, to semantically unrelated words
  - Gina Kuperberg's paper (2) that mentions deficient **P600 responses** in relation to *related* words that impede *incongruity* detection
  - Hsi Tiana Wei's work (3) on linguistic impoverishment in relation to EEG indices of **multisensory processing** in the **inferior frontal gyrus**
- **Neuroimaging**
  - Yingqi Laetitia Wang's work (4) on *contextual insensitivity* and disorganized speech and how it may relate to **MRS glutamate signal**
  - Gina Kuperberg et. al's work (5) on **BOLD** activity in **DLPFC/IPC** to semantically implausible sentences
- **Membrane analysis**
  - Ruth Condray et. al's work (6) on association of membrane **PUFAs** to **N400 response** and cognition

1. Kreher, D. A., Holcomb, P. J., Goff, D., & Kuperberg, G. R. (2008). Neural evidence for faster and further automatic spreading activation in schizophrenic thought disorder. Schizophrenia bulletin, 34(3), 473-482.
2. Kuperberg, G. R. (2010). Language in schizophrenia Part 2: What can psycholinguistics bring to the study of schizophrenia... and vice versa?. Language and linguistics compass, 4(8), 590-604.
3. Wei, Hsi Tiana (2025). MEG in psychosis: Individual differences in neuronal oscillations underlying language disorganization and impoverishment. Poster session presented at the DISCOURSE Consortium in Chicago, IL.
4. Wang, Yingqi Laetitia (2025). MEG in psychosis: Individual differences in neuronal oscillations underlying language disorganization and impoverishment. Poster session presented at the DISCOURSE Consortium in Chicago, IL.
5. Kuperberg, G. R., West, W. C., Lakshmanan, B. M., & Goff, D. (2008). Functional magnetic resonance imaging reveals neuroanatomical dissociations during semantic integration in schizophrenia. Biological psychiatry, 64(5), 407-418.
6. Condray, R., Yao, J. K., Steinhauer, S. R., van Kammen, D. P., Reddy, R. D., & Morrow, L. A. (2008). Semantic memory in schizophrenia: association with cell membrane essential fatty acids. Schizophrenia Research, 106(1), 13-28.

How to study language production differences in psychosis - **Qualitative methods**

- Communication frameworks
  - Vegas Hodgin's work (1) on how conversation partners' own stigma towards people with SMI could lead to lack of adjustment of communication style to fit the SMI person's style
  - Valentina Bambini et. al's work (2) on PragmaCom a learning software to improve pragmatic use of language in people with psychosis
- Thematic analysis
  - Robert J. Bettis et. al's work (3) on themes of social insecurity and alienation in relation to subsequent disorganization in speech

1. Hodgins, V., O'Driscoll, G., & Titone, D. (2023). The impact of neurotypical cognition on communication deficits attributed to pathologized people: schizophrenia as a case study. Applied psycholinguistics, 44(3), 330-342.
2. Bambini, V., Agostoni, G., Buonocore, M., Tonini, E., Bechi, M., Ferri, I., ... & Bosia, M. (2022). It is time to address language disorders in schizophrenia: A RCT on the efficacy of a novel training targeting the pragmatics of communication (PragmaCom). Journal of Communication Disorders, 97, 106196.
3. Bettis, R. J., Faith, L. A., Beard, A. M., Whan, B. A., Hegwood, C. M., Monette, M. A., ... & Minor, K. S. (2024). Narrative Forewarnings: A Qualitative Analysis of the Themes Preceding Disorganized Speech in Schizophrenia. Behavioral Sciences, 14(3), 212.

Future directions I can think of

Some questions/hypotheses I have – feedback/criticisms?

1. Look at the neural signature of *intention* to dismiss a thought and how this varies in clinical vs non populations
    a. See how robust the signature is in controls in relation to the task of attempting to dismiss at thought – for simplicity, use visual cues and robustness of representation in one's mental visualization (1)
    b. Based on this, suggest protocols to speed up dismissal – that is, skew the balance from excessive recurrence with past information to more "normie-response to psychedelics"-ness/"excessively being in the present"
2. Why are auditory/language based "loose associations" more common than visual ones? What does this mean about treatment targets?
3. Can we index psychotic people who have language disorders based on 1) lack of fidelity of mental representations vs 2) associativity vs 3) fast degradation of mental representations, to personalize treatments?
4. How does eye tracking and fidelity of the person's literal visual experience when reading relate to 1) processing of context and 2) mental representation of information?

1. Nishimoto, S., Vu, A. T., Naselaris, T., Benjamini, Y., Yu, B., & Gallant, J. L. (2011). Reconstructing visual experiences from brain activity evoked by natural movies. Current biology, 21(19), 1641-1646.

How to actually generate meaningful hypotheses/treatments in this space?

What I want to know more on…

- How do you actually select a **meaningful hypothesis** in this space? It seems you could make *any hypothesis* and find a convincing answer to support the myriad cognitive, communicative, affective, social, developmental, etc differences in people with psychosis
    - As a joke “off the cuff” hypothesis, here’s one: “If we control for pitch, could indexing affect variability and measures of stress in relation to reading passages of different syntactic/semantic complexity, provide a useful biomarker of language disorder and future psychosis? Or is this merely correlated with whatever is indexed by general intelligence or something else entirely?”
- Which hypotheses actually lend themselves to **meaningful treatments**?
- How much do we need to study psychosis-specific language features versus apply what we know about developmental language delays (1) in general to develop treatments?
- **Communication is a contractual dance** – if people’s experiences defy often defy language, are not able to be expressed or understood (even by themselves), **at what point do they “give up” on providing social signals to “soften/ease” communication**? Does thinking about this matter?
- At what point do we say “enough is enough” and **start to trial more treatments for people with psychosis** who struggle with expressing themselves in a way they like?

1. Boerma, T., Ter Haar, S., Ganga, R., Wijnen, F., Blom, E., & Wierenga, C. J. (2023). What risk factors for Developmental Language Disorder can tell us about the neurobiological mechanisms of language development. Neuroscience & Biobehavioral Reviews, 154, 105398.

What are your ideas?