

Verbal fluency as a measure of lexical-semantic processing in psychotic disorders and schizophrenia

Gabrić, Petar; Kužina, Iva; Vandek, Mija; Erdeljac, Vlasta; Sekulić Sović, Martina; Mimica, Ninoslav; Ostojić, Draženka; Savić, Aleksandar

Conference presentation / Izlaganje na skupu

<https://doi.org/10.17605/osf.io/wtqhy>

Permanent link / Trajna poveznica: <https://um.nsk.hr/um:nbn:hr:131:955839>

Rights / Prava: [Attribution 4.0 International](#) / [Imenovanje 4.0 međunarodna](#)

Download date / Datum preuzimanja: **2024-07-27**



Sveučilište u Zagrebu
Filozofski fakultet
University of Zagreb
Faculty of Humanities
and Social Sciences

Repository / Repozitorij:

[ODRAZ - open repository of the University of Zagreb
Faculty of Humanities and Social Sciences](#)





Verbal fluency as a measure of lexical-semantic processing in psychotic disorders and schizophrenia

Petar Gabrić¹, Iva Kužina¹, Mija Vandek¹, Vlasta Erdeljac¹, Martina Sekulić Savić¹, Ninoslav Mimica^{2,3}, Draženka Ostojić^{3,4}, Aleksandar Savić^{2,3},

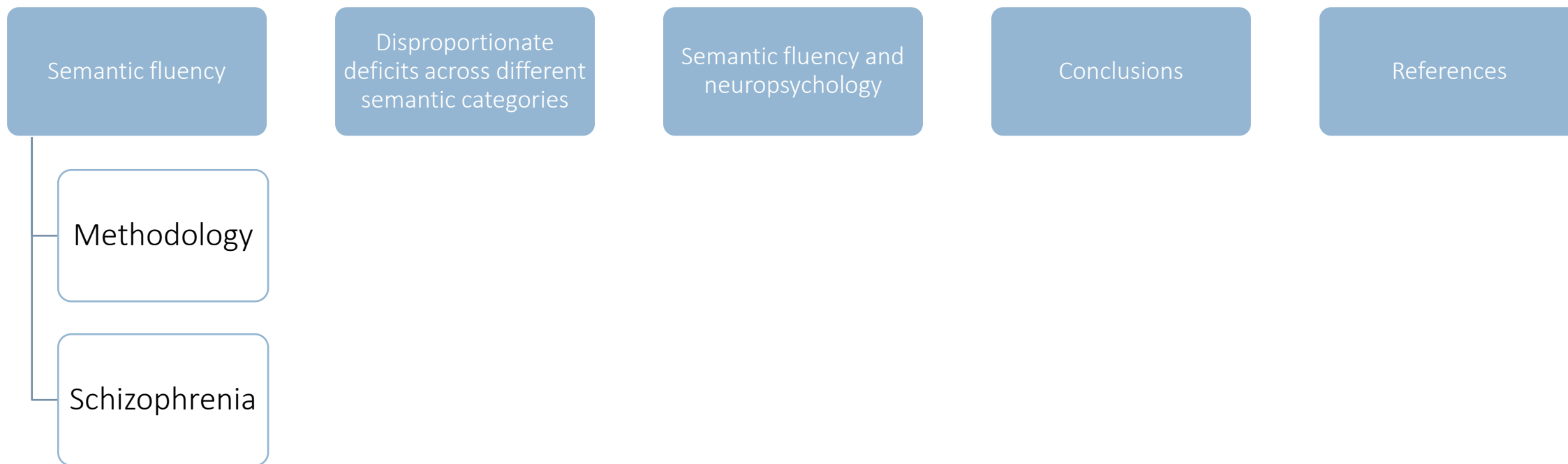
1 University of Zagreb, Faculty of Humanities and Social Sciences, Department of Linguistics, Zagreb, Croatia

2 University of Zagreb, School of Medicine, Chair of Psychiatry and Psychological Medicine

3 University Psychiatric Hospital „Vrapče“, Zagreb, Croatia

4 University of Zagreb, Faculty of Law, Chair of Social Work Areas

Overview



Neural Noise, Far-Spreading Activation, Hyperactivation...

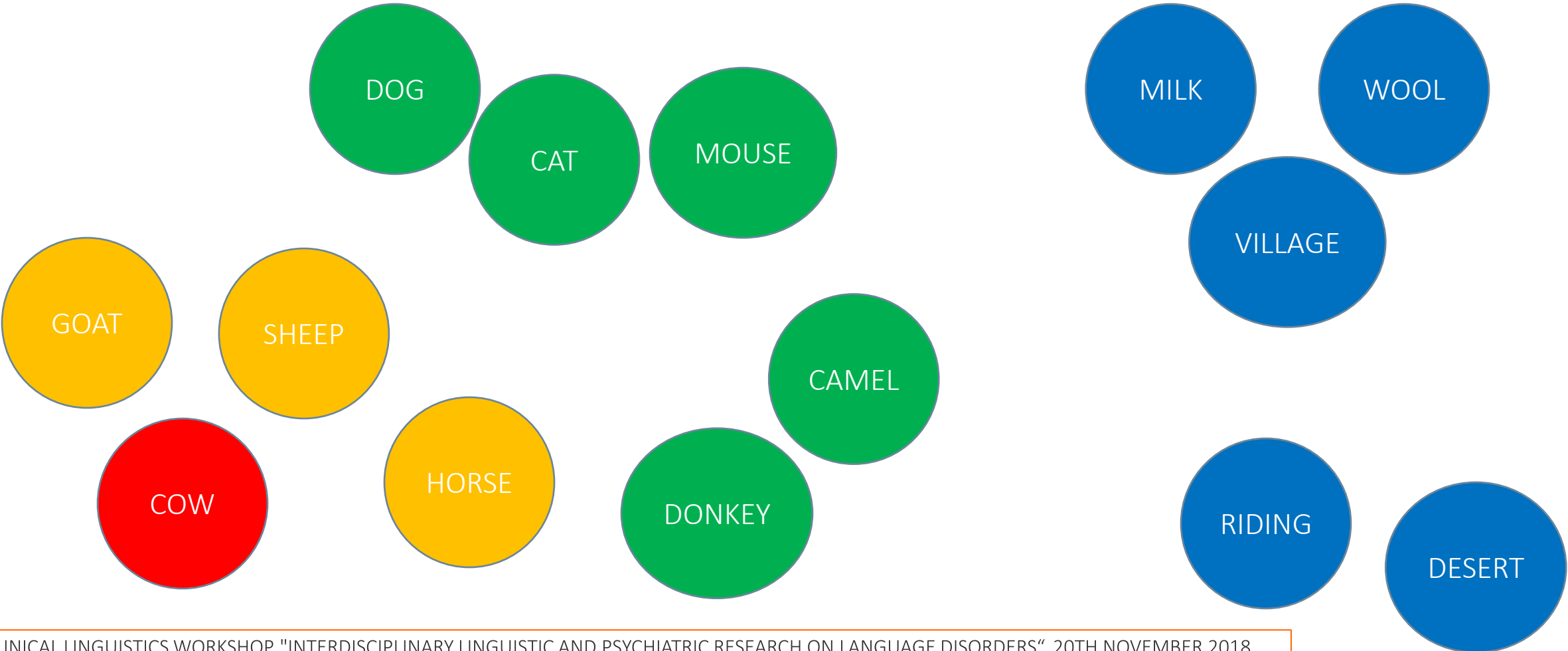
- Spitzer (1997): increased effect of indirect semantic priming in tasks with short stimulus-onset asynchronies compared to non-FTD patients and HS
milk – [white] – black
- Paulsen et al. (1996): semantic space analysis of animal fluency output
- Assaf et al. (2006): fMRI, overactivation of the semantic memory network

References:

- Assaf, Michal et al. (2006). "Abnormal Object Recall and Anterior Cingulate Overactivation Correlate with Formal Thought Disorder in Schizophrenia". *Biol Psychiatry*, 59(5), 452–9.
- Paulsen, Jane et al. (1996). "Impairment of the semantic network in schizophrenia". *Psychiatry Res*, 63, 109–21.
- Spitzer, Manfred (1997). "A cognitive neuroscience view of schizophrenic thought disorder". *Schizophr Bull*, 23(1), 29–50.

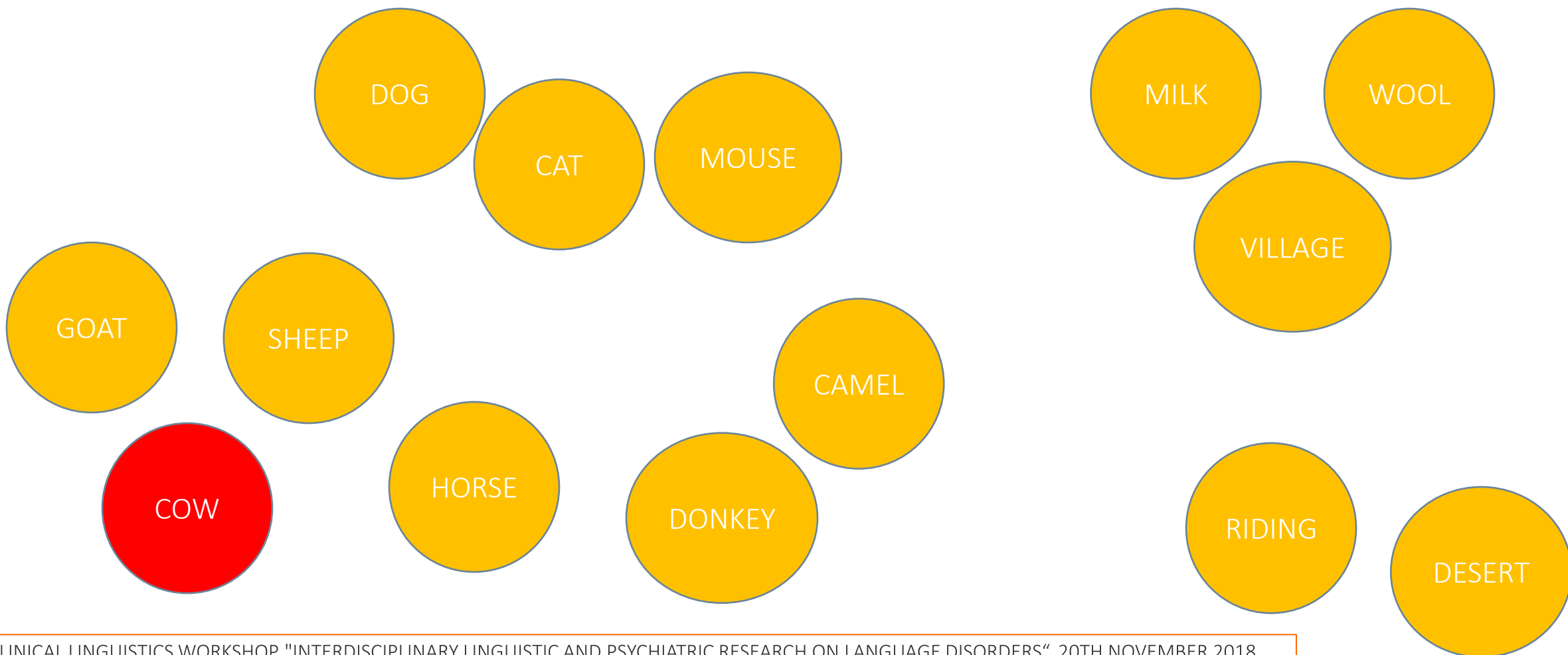
Neural Noise, Far-Spreading Activation, Hyperactivation...

HEALTHY SPEAKERS

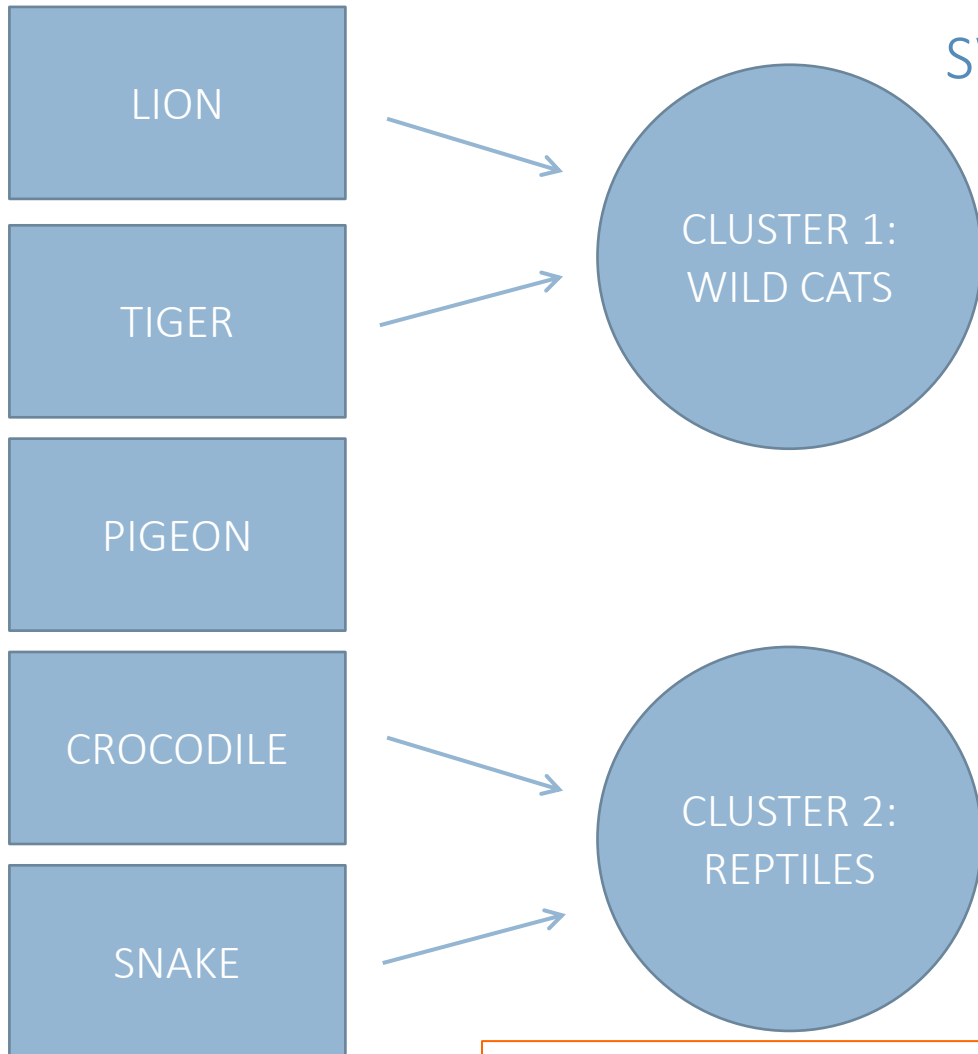


Neural Noise, Far-Spreading Activation, Hyperactivation...

SCHIZOPHRENIA PATIENTS



Semantic Fluency



SWITCHING = 6 total words – 4 clustered w. + 2 clusters = 4

References:

- Troyer, Angela K. et al. (1997) "Clustering and switching as two components of verbal fluency: evidence from younger and older healthy adults". *Neuropsychology*, 11(1), 138–46.
- Troyer, Angela K. (2000). "Normative data for clustering and switching on verbal fluency tasks". *J Clin Exp Neuropsychol.*, 22(3), 370–8.
- Troyer, Angela K., Moscovitch, Morris (2006). "Cognitive processes of verbal fluency tasks". In: Poreh, A. M. (ed.). *Studies on Neuropsychology, Neurology and Cognition. The Quantified Process Approach to Neuropsychological Assessment*. Philadelphia: Taylor & Francis, 143–60.

STUDY	SEMANTIC CATEGORIES	ILLNESS PHASE
Allen et al. (1993)	animals, body parts, fruits	chronic SH
Paulsen et al. (1996)	animals	chronic SH (early- vs. late-onset)
Robert et al. (1998)	animals, fruits	chronic SH
Laurent et al. (1999)	animals, fruits	parents and siblings of SH patients
Chen et al. (2000)	animals, food, transport	chronic SH
Giovannetti et al. (2003)	animals	first-episode psychosis
Phillips et al. (2004)	animals	early-onset SH and schizoaffective disorder
van Beilen et al. (2004)	animals	chronic SH, schizophreniform disorder, schizoaffective disorder
Bozikas et al. (2005)	animals, objects, fruits	chronic SH
Blessing et al. (2009)	animals, sports/fruits, food/clothes/flowers	first-episode psychosis
Becker et al. (2010)	animals	ultra high risk for psychosis
Rinaldi et al. (2013)	animals, fruits/vegetables	chronic SH
Chou et al. (2015)	<i>various</i>	first-episode psychosis
Berberian et al. (2016)	animals	chronic SH
Berto & Galaverna (2016)	body parts	chronic SH
Pauselli et al. (2018)	animals	first-episode psychosis

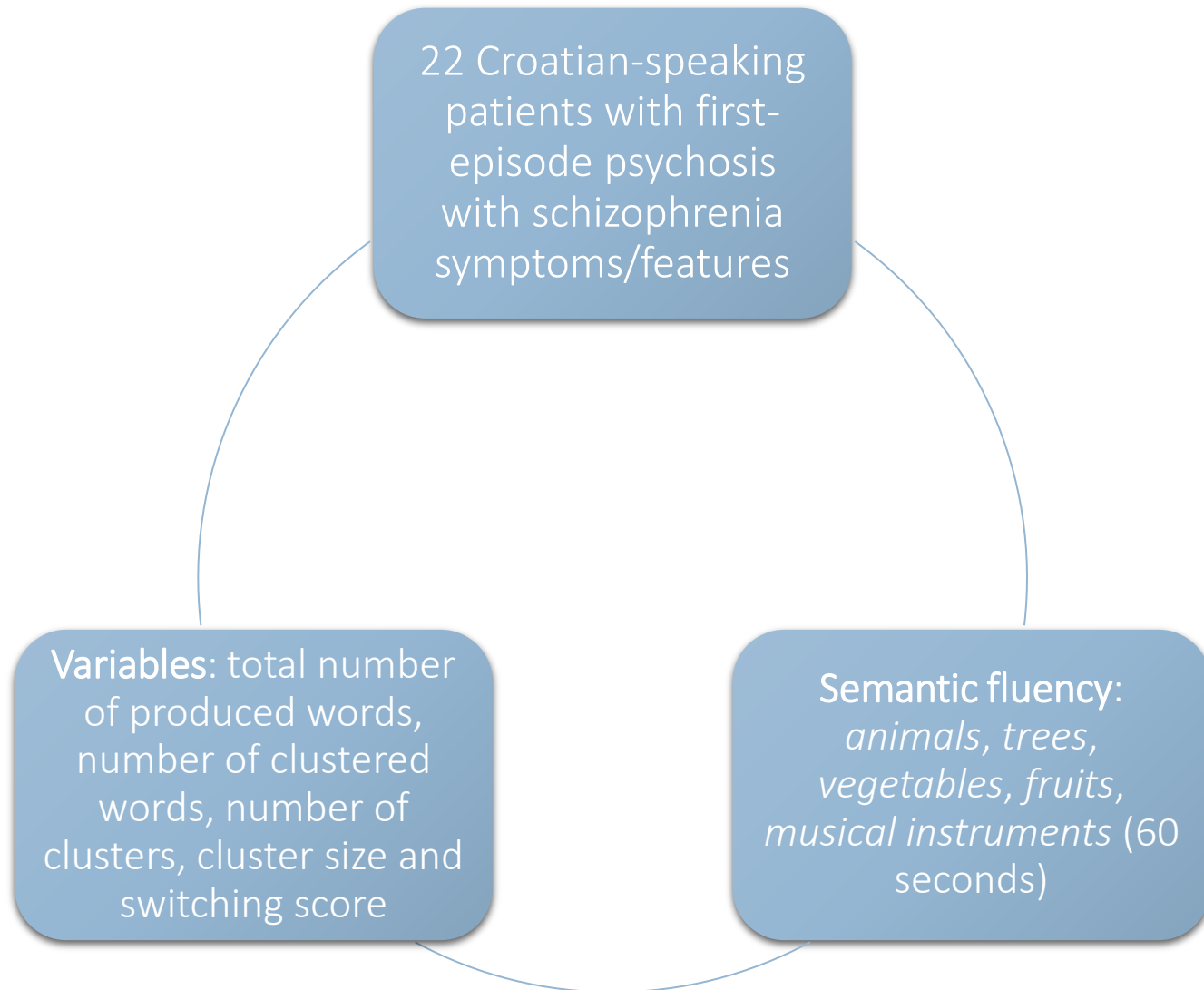
Semantic Fluency in Schizophrenia

STUDY	SEMANTIC CATEGORIES	ILLNESS PHASE
Allen et al. (1993)	animals, body parts, fruits	chronic SH
Paulsen et al. (1996)	animals	chronic SH (early- vs. late-onset)
Robert et al. (1998)	animals, fruits	chronic SH
Laurent et al. (1999)	animals, fruits	parents and siblings of SH patients
Chen et al. (2000)	animals, food, transport	chronic SH
Giovannetti et al. (2003)	animals	first-episode psychosis
Phillips et al. (2004)	animals	early-onset SH and schizoaffective disorder
van Beilen et al. (2004)	animals	chronic SH, schizophreniform disorder, schizoaffective disorder
Bozikas et al. (2005)	animals, objects, fruits	chronic SH
Blessing et al. (2009)	animals, sports/fruits, food/clothes/flowers	first-episode psychosis
Becker et al. (2010)	animals	ultra high risk for psychosis
Rinaldi et al. (2013)	animals, fruits/vegetables	chronic SH
Chou et al. (2015)	<i>various</i>	first-episode psychosis
Berberian et al. (2016)	animals	chronic SH
Berto & Galaverna (2016)	body parts	chronic SH
Pauselli et al. (2018)	animals	first-episode psychosis

Semantic Fluency in Schizophrenia

	Number of clusters	Number of clustered words	Cluster size	Switching
Robert et al. (1998)	n/a	+	n/a	+
Giovannetti et al. (2003)	n/a	+	-	n/a
van Beilen et al. (2004)	-	n/a	+	-
Bozikas et al. (2005)	n/a	- (+)	n/a	- (+)
Rinaldi et al. (2013)	+	n/a	n/a	+
Berberian et al. (2016)	n/a	+	n/a	- (+)

Clustering and Switching in Schizophrenia

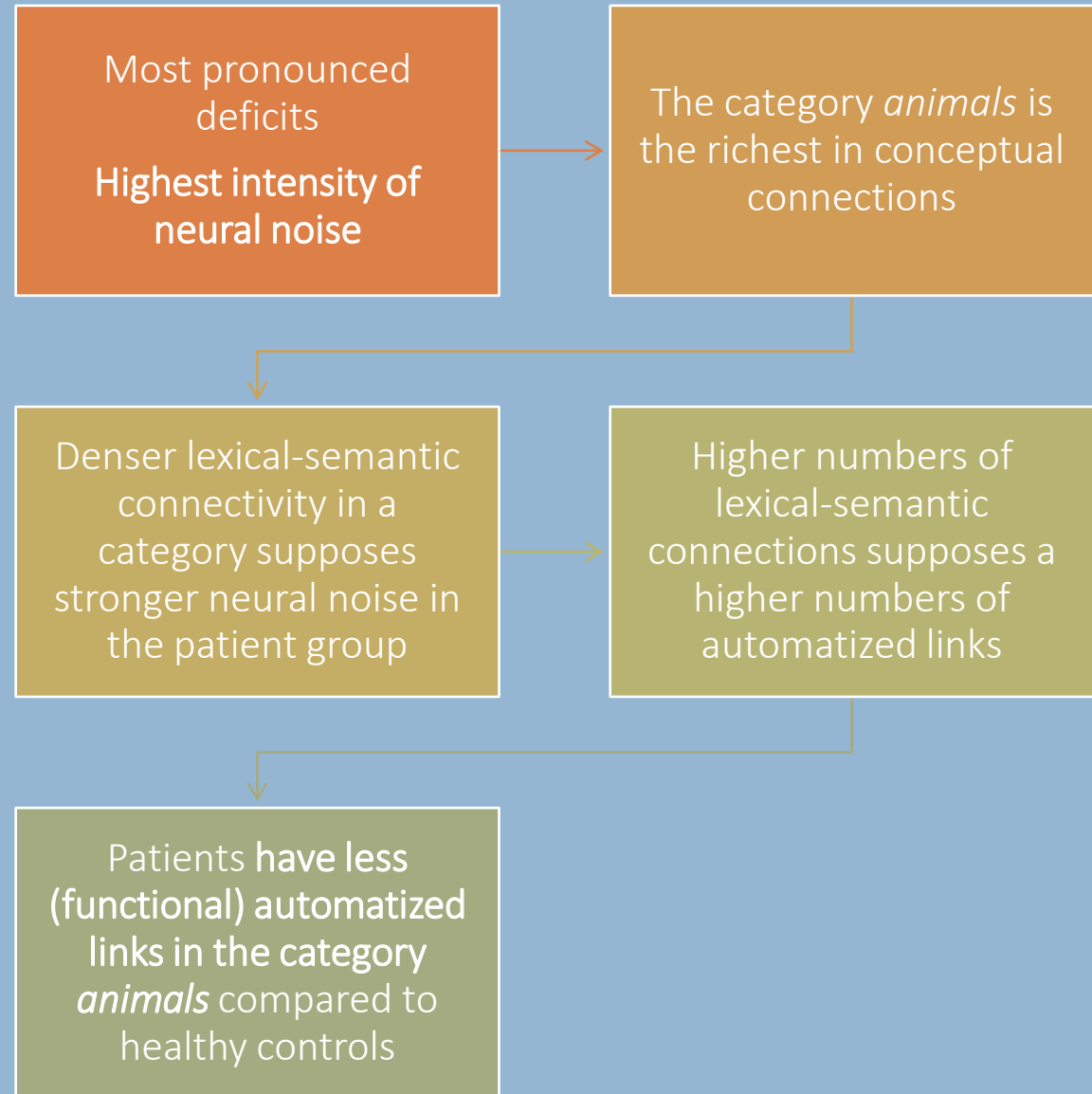


Disproportionate Deficits Across Different Semantic Categories in First-episode Psychosis I

Disproportionate Deficits Across Different Semantic Categories in First-episode Psychosis II

	N of clusters	N of clustered words	cluster size	N of independent words	switching
animals	-	+	+	-	+
vegetables	-	-	+	-	-
instruments	-	-	+	-	-
fruits	-	-	-	-	-
trees	-	-	-	-	-
aggregate	-	-	+	-	-

The Category *Animals*



VERBAL FLUENCY

(60 seconds)

Clustering and switching were calculated after Troyer (2000)⁵.

Semantic Verbal Fluency

- *Animals*
- *Trees*

Action Verbal Fluency

- *Things one can do in the house*

Phonological Verbal Fluency

- *K*
- *M*
- *P*

CANTAB® TEST BATTERY

(The Cambridge Neuropsychological Test Automated Battery)

Spatial Working Memory Task (SWM)

- Assesses visuospatial processing and strategy

Stockings of Cambridge (SOC)

- Requires spatial planning

Attention Switching Task (AST)

- Reflects cognitive flexibility and switching

Paired Associates Learning (PAL)

- Assesses visual episodic memory and learning

Delayed Matching to Sample (DMS)

- Assesses simultaneous visual matching ability and short-term visual recognition memory

Verbal Fluency and Working Memory Interaction

Methodology:

20 healthy subjects

Lexical-semantic retrieval was assessed by verbal fluency

The CANTAB® test battery was administered for assessing working memory

Verbal Fluency and Working Memory Interaction - Results

DMS was significantly correlated with the total number of produced words and the number of clusters in all VFs, but the correlation with switching was present only in action and phonemic VF

AST showed high significant correlations with all measures in *tree* VF, and medium significant correlations with TOT and NCL in action VF

SWM had high significant correlations with TOT and SW in action VF, high significant correlations with NCL in *tree* VF and medium significant correlations with SW in *animal* VF

SOC had medium correlations with TOT in overall semantic VF and NCL in phonemic VF

PAL showed systematically high correlations with SW in *tree* VF

Verbal Fluency and Working Memory Interaction - conclusions

Visual information recall is an essential component of both automatic and less automatic lexical-semantic retrieval processes

Visual information recall aids clustering strategies in verbal fluency, but is only limitedly related to switching

Retrieval in **lexical-semantic categories with less automatized links** (e.g. trees) is assisted by the **central executive**, specifically attention switching, and visual episodic memory retrieval. Retrieval in action fluency is assisted by spatial working memory and attention switching

Spatial working memory and specifically **spatial planning** are limitedly involved in both automatic and less automatic retrieval processes

Due to possibly considerable recency effects, **phonemic fluency tasks** should be administered **after semantic fluency tasks**, or specifically animal fluency

Conclusions

Semantic fluency is a heterogenous task

Different mechanisms involved in the recall from different lexical-semantic categories

Studies of semantic fluency in schizophrenia give support to the far-spreading activation theory

Hyperactivation more pronounced in the more automatized category *animals*

Future Research

Inclusion of psycholinguistic parameters such as imageability, abstractness/concreteness, frequency etc. in semantic fluency output analysis

Implications for our knowledge about the inner structure of the mental lexicon

More detailed description of the neuropsychological mechanisms underlying different semantic fluency tasks

Defining specific lexical-semantic deficits as a predictors of particular illness phases in first-episode psychosis

References

- Allen, Heidi A. et al. (1993). "Negative Features, Retrieval Processes and Verbal Fluency in Schizophrenia". *BJP*, 163, 769–75.
- Assaf, Michal et al. (2006). "Abnormal Object Recall and Anterior Cingulate Overactivation Correlate with Formal Thought Disorder in Schizophrenia". *Biol Psychiatry*, 59(5), 452–9.
- Becker, H. E. et al. (2010). "Verbal fluency as a possible predictor for psychosis". *Eur Psychiatry*, 25(2), 105–10.
- Berberian, Arthur A. et al. (2016). "Is semantic verbal fluency impairment explained by executive function deficits in schizophrenia?" *Rev Bras Psiquiatr*, 38, 121–26.
- Berto, G. and Galaverna, F. S. (2016). "Semantic memory organization on verbal fluency test "Human Body Parts" in patients with chronic schizophrenia diagnosis and healthy controls". *European Journal of Psychiatry*, 30(2), 97–108.
- Blessing, A. et al. (2009). "Verbal fluency tasks in first-episode psychosis". *Clinical Neuropsychiatry*, 6(1), 21–8.
- Bozikas, Vasilis P. et al. (2005). "Disproportionate impairment in semantic verbal fluency in schizophrenia: differential deficit in clustering". *Schizophr Res*, 74, 51–9.
- Chen, Ronald Y. L. et al. (2000). "Verbal fluency in schizophrenia: reduction in semantic store". *Aust N Z J Psychiatry*, 34, 43–8.
- Chou, P.-H. et al. (2015). "Duration of Untreated Psychosis and Brain Function during Verbal Fluency Testing in First-Episode Schizophrenia: A Near-Infrared Spectroscopy Study". *Sci Rep*, 5, 18069.
- Covington, Micheal A. et al. (2005). "Schizophrenia and the structure of language: the linguist's view". *Schizophr Res*, 77, 85–98.
- Gabrić, P., Bosanac, B., Kužina, I., Vandek, M., Sekulić Sović, M., Mimica, N., Savić, A. (2018). "Analiza produkcije klastera u testu kategorijske fluentnosti kod pacijenata s prvom epizodom shizofrenije". In: Stolic, D., Nigoević, M. (ed.). *Jezik i um. Knjiga sažetaka = Language and Mind. Book of Abstracts*. Zagreb: Srednja Europa / Hrvatsko društvo za primijenjenu lingvistiku, 63. DOI: 10.13140/RG.2.2.15979.23848/2
- Giovannetti, T. et al. (2003). "Category fluency in first-episode schizophrenia". *J Int Neuropsychol Soc*, 9, 384–93.
- Karlsgodt, Katherine H. et al. (2010). "Structural and Functional Brain Abnormalities in Schizophrenia". *Curr Dir Psychol Sci*, 19(4), 226–31.
- Kužina, I., Vandek, M., Gabrić, P., Erdeljac, V., Sekulić Sović, M., Mimica, N., Savić, A. (2018). "Neural noise caused by executive dysfunction accounts for lexical-semantic deficits in first-episode psychosis". V Congreso Internacional de Lingüística Clínica / 5th International Conference of Clinical Linguistics, Cádiz, Spain. DOI: 10.13140/RG.2.2.36306.61128
- Laurent, A. et al. (1999). "Neuropsychological functioning among non-psychotic siblings and parents of schizophrenic patients". *Psychiatry Res*, 87(2–3), 147–57.
- Kuperberg, Gina R., Caplan, David (2003). "Language dysfunction in schizophrenia". In: Schiffer, Randolph B. et al. (ed.). *Neuropsychiatry*. Philadelphia: Lippincott Williams & Wilkins, 444–66.
- Paulsen, Jane et al. (1996). "Impairment of the semantic network in schizophrenia". *Psychiatry Res*, 63, 109–21.
- Pauselli, L. et al. (2018). "Computational linguistic analysis applied to a semantic fluency task to measure derailment and tangentiality in schizophrenia". *Psychiatry Research*, 263, 74–9.
- Phillips, T. J. et al. (2004). "Semantic fluency is impaired but phonemic and design fluency are preserved in early-onset schizophrenia". *Schizophr Res*, 70, 215–22.
- Rinaldi, R. et al. (2013). "Language, executive functioning and symptomatology—is fluency a transversal tool in schizophrenia?". *Open Journal of Psychiatry*, 3, 358–69.
- Robert, P. H. et al. (1998). "Clustering and switching strategies in verbal fluency tasks: comparison between schizophrenics and healthy adults". *J Int Neuropsychol Soc*, 4(6), 539–46.
- Sekulić Sović, M., Erdeljac, V., Kužina, I., Vandek, M., Gabrić, P., Mimica, N., Savić, A. (2018). "Does animacy feature facilitate lexical-semantic processing in first-episode psychosis?". 17th International Clinical Phonetics and Linguistics Association Conference, Saint Julian's, Malta. DOI: 10.13140/RG.2.2.14603.13602
- Shao, Zeshu et al. (2014). "What do verbal fluency tasks measure? Predictors of verbal fluency performance in older adults". *Frontiers in Psychology*, 5, 772.
- Spitzer, Manfred (1997). "A cognitive neuroscience view of schizophrenic thought disorder". *Schizophr Bull*, 23(1), 29–50.
- Troyer, Angela K. et al. (1997) "Clustering and switching as two components of verbal fluency: evidence from younger and older healthy adults". *Neuropsychology*, 11(1), 138–46.
- Troyer, Angela K. (2000). "Normative data for clustering and switching on verbal fluency tasks". *J Clin Exp Neuropsychol.*, 22(3), 370–8.
- Troyer, Angela K., Moscovitch, Morris (2006). "Cognitive processes of verbal fluency tasks". In: Poreh, A. M. (ed.). *Studies on Neuropsychology, Neurology and Cognition. The Quantified Process Approach to Neuropsychological Assessment*. Philadelphia: Taylor & Francis, 143–60.
- van Beilen, M. (2004). "What is measured by verbal fluency tests in schizophrenia?". *Schizophr Res*, 69 (2–3), 267–76.
- Vandek, M., Gabrić, P., Kužina, I., Erdeljac, V., Sekulić Sović, M. (2018). "Verbal fluency and working memory interaction". 10th International Workshop on Language Production, Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands. DOI: 10.13140/RG.2.2.29819.62243/2