



HAL
open science

The update of self-identity: Importance of assessing autobiographical memory in major depressive disorder

Samuel Bulteau, Roman Malo, Zoé Holland, Andrew Laurin, Anne Sauvaget

► To cite this version:

Samuel Bulteau, Roman Malo, Zoé Holland, Andrew Laurin, Anne Sauvaget. The update of self-identity: Importance of assessing autobiographical memory in major depressive disorder. *WIREs Cognitive Science*, 2023, 14 (3), pp.e1644. 10.1002/wcs.1644 . hal-04236766

HAL Id: hal-04236766

<https://hal.science/hal-04236766>

Submitted on 11 Oct 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

The update of self-identity: Importance of assessing autobiographical memory in major depressive disorder

Samuel Bulteau^{1,2}  | Roman Malo³ | Zoé Holland¹ | Andrew Laurin^{1,4}  | Anne Sauvaget^{1,4}

¹Department of Addictology and Psychiatry, Old Age Psychiatry unit, Clinical Investigation Unit 18, CHU Nantes, Nantes, France

²INSERM, MethodS in Patients-Centered Outcomes and Health Research, UMR 1246 SPHERE, Nantes Université, Nantes, France

³Clinical Psychology Department, Nantes University, Nantes, France

⁴CHU Nantes, Movement - Interactions - Performance, MIP, UR 4334, Nantes Université, Nantes, France

Correspondence

Samuel Bulteau, Department of Addictology and Psychiatry, Old Age Psychiatry unit, Clinical Investigation Unit 18, CHU Nantes, F-44000 Nantes, France.

Email: samuel.bulteau@chu-nantes.fr

Edited by: Mohamad El Haj, Editor

Abstract

Major depressive disorder is a leading global cause of disability. There is a growing interest for memory in mood disorders since it might constitute an original tool for prevention, diagnosis, and treatment. MDD is associated with impaired autobiographical memory characterized by a tendency to overgeneral memory, rather than vivid episodic self-defining memory, which is mandatory for problem-solving and projection in the future. This memory bias is maintained by three mechanisms: ruminations, avoidance, and impaired executive control. If we adopt a broader and comprehensive perspective, we can hypothesize that all those alterations have the potential to impair self-identity updating. We posit that this update requires a double referencing process: (1) to internalized self-representation and (2) to an externalized framework dealing with the representation of the consequence of actions. Diagnostic and therapeutic implications are discussed in the light of this model and the importance of assessing autobiographical memory in MDD is highlighted.

This article is categorized under:

Psychology > Memory

Psychology > Brain Function and Dysfunction

Neuroscience > Clinical

KEYWORDS

autobiographical memory, depression, neuroplasticity, psychotherapy, selfhood

1 | INTRODUCTION

Major depressive disorder is a leading global cause of disability (Collins et al., 2011; Gustavsson et al., 2011). There is a growing interest for memory in mood disorders since it might constitute an original tool for prevention, diagnosis, and treatment.

Memory performance impairment in MDD is associated with poor attention, poor motivation, higher anxiety and sleep disturbances. Moreover, chronic stress and major depressive disorder are associated with stronger negative memories retrieval and impaired executive functions (de Sousa et al., 2021; Rock et al., 2014; Semkowska et al., 2019; Young

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2023 The Authors. *WIREs Cognitive Science* published by Wiley Periodicals LLC.

et al., 2016). Changes in long-term memory episodic and retrospective autobiographical memory (AM) in MDD are characterized by a lack of specificity in retrieved memories which was referred to as “overgeneral memory” (OGM) by van Vreeswijk and De Wilde (2004). As highlighted in a recent review, overgeneral AM is a risk factor of depressive disorder and AM deficits might be trait-like in depressive patients (Fang & Dong, 2022). OGM may be a consequence of intrusive-memory avoidance and is quite stable over time (i.e., remaining after remission). It has been correlated to reduced problem-solving performance. On the contrary, better capacities to recall specific past life events have been associated with better capacities to imagine the future, and the production of a larger set of alternative problem-solving actions (Pollock & Williams, 2001; Williams et al., 1996). This observation concurs with a very recent fundamental research article highlighting that the brain selects the memories that have the highest potential of predictability of future events (Sherman et al., 2022). Anticipation and coping skills (the initiation of original behaviors in new challenging contexts), may thus directly be based on memory selection. Williams et al. formed the hypothesis that OGM is maintained by three mechanisms: capture and rumination (CaR), functional avoidance (FA), and impaired executive control (X) which is associated with rumination (Williams et al., 2007). Thus, in MDD, autobiographical memory is closely intertwined with rumination (excessive negative self-referencing) and dysexecutive syndrome. Ruminations compete with the cognitive regulation of negative affects and effective reappraisal of events, as well as the determination of novel aims and perspectives (Nolen-Hoeksema et al., 2008). In this regard, self-defining memories, which corresponds to vivid memories that lead to the creation of narrative parts of lifespan, may be of particular importance in MDD prognosis.

Considering autobiographical memory, not solely, but in interactions with these domains (avoidance, executive control, and rumination), is paramount. Furthermore, recent elucidations proved that MDD physiopathology accentuated the structural and functional impact of stress on the brain (Belleau et al., 2019; de Sousa et al., 2021; Piasecka et al., 2020; Toda et al., 2019; Yroni et al., 2018). It particularly impairs limbic areas (Godlewska et al., 2012; He et al., 2018; Korb et al., 2011; Langenecker et al., 2018; Notebaert et al., 2018; Phillips et al., 2015; Williams et al., 1996; Yoon et al., 2018); Cognitive Control Network (hypoactive) (Pimontel et al., 2016; Wagner et al., 2018), and Default Mode Network (hyperactive) (Damasio, 2010; Hooley et al., 2009; Nejad et al., 2013; Northoff et al., 2006; Sendi et al., 2021; Sui & Humphreys, 2015; Vanderhasselt et al., 2011; Wagner et al., 2015). These alterations are respectively associated with negative attentional, emotional and memory biases, as well as cognitive inflexibility, and ruminations.

In this configuration, subjects become at the psychological and biological level more and more resistant to subsequent environmental inputs (e.g., positive information disconfirming negative beliefs and expectations). They are unable to adjust to a continually changing environment, or really learn from the experience, rather than just react to the event (amygdala-striatal bottom-up control take precedence over frontal-hippocampal networks; de Sousa et al., 2021).

To better understand the dynamic interactions of autobiographical memory bias, avoidance, ruminations, and impaired executive control, we propose to adopt the broader perspective of self-identity updating, which requires an integration of memory, self-referencing, and cognitive flexibility. In this perspective, we make the hypothesis that MDD could be considered as a deficient self-identity updating pathology.

2 | MAJOR DEPRESSIVE DISORDER: DYSFUNCTIONAL SELF-IDENTITY UPDATING?

Autobiographical memory in patients with MDD constitutes an anchor, or a framework of reference, for the update of patients' identity (El Haj & Gallouj, 2019). Our thesis is that the stability of selfhood, that is, the feeling of continuity of one's identity, may involve two referencing processes: (i) reference to an internalized self-representation depending on autobiographical memories; (ii) reference to environments feed-back resulting from our engagement in actions (compared with prospective memory, itself based on past-oriented mind-wandering; Girardeau et al., 2022). Moreover, we know that external stimuli and internal frame of reference can have a positive or negative valence. In MDD, a disbalance between these two references may occur with an excessive reference to negative self-defining memories (i.e., a stronger implicit association between the mental concept of oneself and negative characteristics or experiences; Phillips et al., 2010; van Randenborgh et al., 2016). The self-referencing process itself is dysfunctional in MDD as Default Mode Network. It is important to note that Default Mode Network also plays a crucial role in the distinction between the self and the non-self as well as in the integration of memory and perception (Boeker and Kraehenmann, 2018). This network shows an unstable connectivity in this disease (Wise et al., 2017), that in turn may fragilize

selfhood. In other words, selfhood may requires the integration of external and internal information leading to the confirmation or disconfirmation of internalized modelization of oneself in a Bayesian perspective as suggested in Figure 1.

Preservation of selfhood (understood as the subjective identity continuity at the phenomenological level), in face of stress or failures, may be central in the self-evaluation homeostasis. We hypothesize that in healthy people, selfhood is strengthened by an adequate balance and coherence between positive internalized self-defining memories (internal referential) and the representation of actual positive feed-backs resulting from engagement in goal-directed behavior in the environment (external referential). In depression we posit that the update of subjective identity is impaired by negative repeated feed-back from the environment associated with avoidance. Selfhood (relying on the update of one own's representation and consciousness) may be maintained through excessive increased self-focus, relying on the internal referential (counterbalancing disengagement from the environment). If the prominent referential, that is, the internal one, has a negative valence (due to previous negative life experience, and internalized stigma), it will lead to an increase of negative self-reference which will, in turn, increase withdrawal. This pathological process can worsen and eventually lead to the emergence of psychotic or suicidal thoughts.

In this model, a healthy state is defined by a congruence between the engagement in the external world and a positive representation of oneself, enriched by vivid positive life experiences. For example, the Bayesian approach posits that brain simulates the probability of success in a social interaction (and thus engagement in the environment) depending on pre-existent self-representations (Moutoussis et al., 2014). Paradoxically, remaining oneself supposes an ability to grow in an evolving environment. In severe depression, the external world, seen as dangerous or deceptive, may no longer be considered in the identity updating process. While patients avoid external world, selfhood is

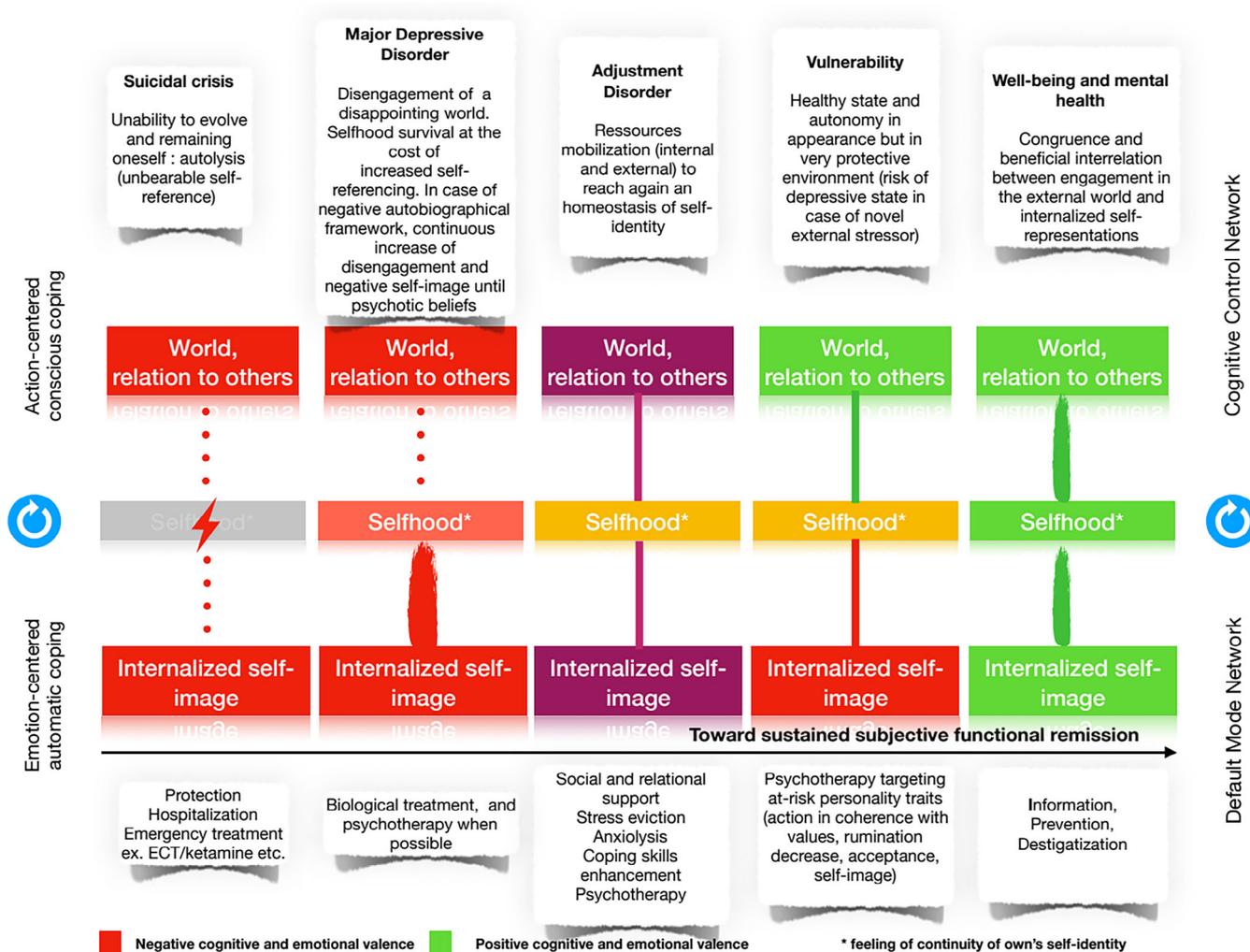


FIGURE 1 Integrative model of major depressive disorder understood as an impairment of self-identity updating underlying selfhood, resulting from a pathological process of reference to the self and to the environment.

maintained on account of a unique referencing process toward internalized preexisting self-defining memories (Boeker & Kraehenmann, 2018). If these memories have a negative emotional valence (e.g., in case of early negative experiences), the negative referencing increases mechanically until destructuring of the self occurs. Suicidal crisis corresponds to an impossibility of remaining oneself (i.e., an excessive and exclusive unbearable self-referencing). Between healthy state and depression, adjustment trouble is a period of emotional distress, in which the subject tries to find external and internal resources to protect his self-identity. Interestingly, in manic episodes, we observe the opposite than in depression: the subject's consciousness is solely focused on goal-directed behavior, lacking references to past (Bulteau et al., 2018).

We thus posit that clinical trials for depression should not only assess depression scores, but also the degree of self-reference, the quality of internalized stigmatized memories, as well as the degree of integration of confirming/disconfirming environment feed-back. It would allow a more dynamical characterization of the pathological process according to personal characteristics, including internal frame of reference that feeds from the personal autobiographical memory. Moreover, it could also be considered that the depressive episode itself constitutes a traumatic memory (the anxiety of feeling one's own identity destructuring) thus destabilizing patients and exposing to further relapse.

3 | IMPLICATIONS FOR TREATMENT

3.1 | Goal

As a consequence, treatments for MDD should not only have the aim to decrease sadness and anhedonia, but target negative self-defining memories, as well as the attention given to events disconfirming negative beliefs and internalized self-image. Depression can be considered as a type of “self-bankruptcy,” in which the subject no longer has access to positive memories to shape his future. In this regard, psychotherapy should focus on the access to positive memories. To obtain sustained subjective remission treatment should thus embrace: reappraisal, insight, symptoms understanding and acceptance, expectations, beliefs and way of life, adaptation to the context, and allow a more flexible self-reference process, based on a healthier internal self-representation (Northoff, 2007). In other words, a future challenge for psychiatry will be to sequence and combine different approaches enhancing neuroplasticity and cognitive and psychological flexibility, which will improve problems solving and self-perception, which are some of the most desirable outcomes from the patients' perspective (Chevance et al., 2020), and ultimately support a healthy self-identity update. In summary, comprehensive treatment for MDD should provide (de Sousa et al., 2021): (1) cognitive bias modification (attentional, interpretative, associations of events with the self); (2) rumination disengagement; (3) enhanced executive functioning, acceptance, and flexibility (cognitive, psychological, behavioral); (4) enhanced neuroplasticity and biological stress counteracting; (5) better PFC-limbic connectivity; (6) moving from overgeneral autobiographical memory toward more specific and positive memories; (7) environment quality (trauma prevention, social support, mutual benevolence, lower social comparison, etc.).

3.2 | Multimodal approaches

Multimodal approaches are more effective than a unique isolated treatment (Candlish et al., 2019; Laird et al., 2019; Wilkinson et al., 2019). Such treatment may combine (i) psychotherapy (such as narrative therapy, MBCT, CBT, ACT, EMDR, and memory reconsolidation, cognitive control training, autobiographical episodic memory training, and any other kind of validated psychotherapy) and (ii) psychotropic drugs or neuromodulation, in an individualized manner. Effectively, multimodal approaches could focus on cognitive control network activation during different tasks involving emotion regulation, memory retrieval, self-reference, and reappraisal (Assaf et al., 2018; Kanter et al., 2006; Wu et al., 2020). As a matter of example, augmented psychotherapy with ketamine may be promising, while enhancing updating abilities. Ketamine showed ability to: quickly improve mood; induce a synaptogenic signaling cascade promoting brain plasticity; improve PFC and subgenual ACC connectivity; decrease negative mnemonic associations (Botteman, Baldacci, et al., 2022; Stuart et al., 2015); and induce flexibility in patients' mental representations of the self and beliefs (Price et al., 2014; Price & Duman, 2020). Interestingly, recent studies have tried to combine biological treatment with plasticity enhancement properties, such as ketamine and positive self-associations training (Price et al., 2022). In a recent study, patients with TRD, as opposed to control patients, better updated their beliefs after

positive rather than negative news, following a single ketamine infusion (Bottemanne, Morlaas, et al., 2022). Augmented psychotherapy can also be envisaged with the combination of positive self-association training and brain stimulation techniques targeting cognitive control network (dlPFC and ACC connectivity), that seems to be a crucial prognosis factor for MDD treatment, as illustrated by promising neurostimulation treatments based on individual fMRI (Cole et al., 2020; Whitfield-Gabrieli et al., 2020).

4 | RESEARCH PERSPECTIVES

Much work remains ongoing in understanding the role of autobiographical memory in MDD. For example, which type of memories are more likely to influence self-representation and consciousness and expose patients to recurrences? How does autobiographical memory evolves during treatment courses? How does self-perception evolves during treatment according to several factors such as: previous experience, personality, level of depressive symptomatology, awareness and understanding of symptoms, treatment type, context, frame of reference, appraisal capacities, as well as values and priorities (Braunstein et al., 2017; Bulteau et al., 2019; Gao et al., 2018)? In which extent the retrieval of positive memories can work as a resilience factor in subjects at risk of developing depression (Askelund et al., 2019)? To which extent in psychotherapy can we use fictional materials to balance impaired personal memories (i.e., take into account the therapeutic potential of musical, pictural, dramatic, or literary artwork to safely provide new identities and memories or imaginary experiences to update self-identity; Sperduti et al., 2016)? Are there any biomarkers related to autobiographical memory that could help predicting vulnerability toward depression or constitute early markers of response to treatment? Recently it was found, for example, that positive and negative emotional memories trigger more eye fixations and saccades, and shorter fixation duration, than neutral memories (El Haj et al., 2017). Moreover, a larger pupil diameter is observed during the retrieval of specific than general self-defining memories (El Haj et al., 2022). Thus, eye movements and pupil dilatation could constitute a marker of the effect of augmented psychotherapy targeting autobiographical memory in MDD. Eventually, studying autobiographical memory may be all the more crucial in late-life depression since old age psychiatrists have to deal with the whole biography of patients, memory and executive-function impairment, as well as co-morbid neurodegenerative diseases, that can present with different patterns of autobiographical memory and future thinking (La Corte et al., 2021).

5 | CONCLUSION

Depression is a particular disease since it alters self-perception and events reappraisal, due to attentional, emotional, cognitive, and memory negative bias. The use of memory constitutes a promising field for the assessment and treatment of mood disorders. Bearing in mind the association of autobiography memory with rumination processes, cognitive and psychological flexibility, as well as time perception and anticipation, this type of memory should be further considered in mood disorders.

AUTHOR CONTRIBUTIONS

Samuel Bulteau: Conceptualization (lead); supervision (lead); validation (lead); writing – original draft (lead). **Roman Malo:** Writing – original draft (supporting). **Zoé Holland:** Writing – review and editing (equal). **Andrew Laurin:** Writing – review and editing (equal). **Anne Sauvaget:** Supervision (supporting); validation (supporting); writing – original draft (supporting).

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ORCID

Samuel Bulteau  <https://orcid.org/0000-0003-4855-2173>

Andrew Laurin  <https://orcid.org/0000-0002-7806-961X>

RELATED WIREs ARTICLES

[Autobiographical memory in dementia syndromes-An integrative review](#)

Further Reading

- Bartova, L., Dold, M., Kautzky, A., Fabbri, C., Spies, M., Serretti, A., Souery, D., Mendlewicz, J., Zohar, J., Montgomery, S., Schosser, A., & Kasper, S. (2019). Results of the European Group for the Study of resistant depression (GSRD)—Basis for further research and clinical practice. *The World Journal of Biological Psychiatry*, 20(6), 427–448. <https://doi.org/10.1080/15622975.2019.1635270>
- Bauer, M., Rush, A. J., Ricken, R., Pilhatsch, M., & Adli, M. (2019). Algorithms for treatment of major depressive disorder: Efficacy and cost-effectiveness. *Pharmacopsychiatry*, 52(3), 117–125. <https://doi.org/10.1055/a-0643-4830>
- Bennabi, D., Aouizerate, B., El-Hage, W., Doumy, O., Moliere, F., Courtet, P., Nieto, I., Bellivier, F., Bubrovsky, M., Vaiva, G., Holtzmann, J., Bougerol, T., Richieri, R., Lancon, C., Camus, V., Saba, G., Haesbaert, F., d'Amato, T., Charpeaud, T., ... Haffen, E. (2015). Risk factors for treatment resistance in unipolar depression: A systematic review. *Journal of Affective Disorders*, 171, 137–141. <https://doi.org/10.1016/j.jad.2014.09.020>
- Bland, A. R., Roiser, J. P., Mehta, M. A., Schei, T., Boland, H., Campbell-Meiklejohn, D. K., Emsley, R. A., Munafo, M. R., Penton-Voak, I. S., Seara-Cardoso, A., Viding, E., Voon, V., Sahakian, B. J., Robbins, T. W., & Elliott, R. (2016). EMOTICOM: A neuropsychological test battery to evaluate emotion, motivation, impulsivity, and social cognition. *Frontiers in Behavioral Neuroscience*, 10, 25. <https://doi.org/10.3389/fnbeh.2016.00025>
- Browning, M., Kingslake, J., Dourish, C. T., Goodwin, G. M., Harmer, C. J., & Dawson, G. R. (2019). Predicting treatment response to antidepressant medication using early changes in emotional processing. *European Neuropsychopharmacology*, 29(1), 6675. <https://doi.org/10.1016/j.euroneuro.2018.11.1102>
- Bulteau, S., Péré, M., Blanchin, M., Poulet, E., Brunelin, J., Sauvaget, A., & Sébille, V. (2021). Higher negative self-reference level in patients with personality disorders and suicide attempt(s) history during biological treatment for major depressive disorder: Clinical implications. *Frontiers in Psychology*, 12, 631614. <https://doi.org/10.3389/fpsyg.2021.631614>
- Cavaletti, F., & Heimann, K. (2020). Longing for tomorrow: Phenomenology, cognitive psychology, and the methodological bases of exploring time experience in depression. *Phenomenology and the Cognitive Sciences*, 19(2), 271–289.
- Chen, C., Takahashi, T., Nakagawa, S., Inoue, T., & Kusumi, I. (2015). Reinforcement learning in depression: A review of computational research. *Neuroscience and Biobehavioral Reviews*, 55, 247–267. <https://doi.org/10.1016/j.neubiorev.2015.05.005>
- Cosci, F., & Fava, G. A. (2013). Staging of mental disorders: Systematic review. *Psychotherapy and Psychosomatics*, 82(1), 20–34. <https://doi.org/10.1159/000342243>
- Disner, S. G., Beevers, C. G., Haigh, E. A. P., & Beck, A. T. (2011). Neural mechanisms of the cognitive model of depression. *Nature Reviews Neuroscience*, 12(8), 467–477. <https://doi.org/10.1038/nrn3027>
- Du, L., Liu, H., Du, W., Chao, F., Zhang, L., Wang, K., Huang, C., Gao, Y., & Tang, Y. (2018). Stimulated left DLPFC-nucleus accumbens functional connectivity predicts the anti-depression and anti-anxiety effects of rTMS for depression. *Translational Psychiatry*, 7(11), 3. <https://doi.org/10.1038/s41398-017-0005-6>
- Dunlop, K., Hanlon, C. A., & Downar, J. (2016). Noninvasive brain stimulation treatments for addiction and major depression. *Annals of the New York Academy of Sciences*, 1394, 31–54. <https://doi.org/10.1111/nyas.12985>
- Fregna, L., Locatelli, M., & Colombo, C. (2020). The phenomenology of depression. *Phenomenology and Mind*, 18, 38–54.
- Gilboa-Schechtman, E., Erhard-Weiss, D., & Jeczemien, P. (2002). Interpersonal deficits meet cognitive biases: Memory for facial expressions in depressed and anxious men and women. *Psychiatry Research*, 113(3), 279–293. [https://doi.org/10.1016/s0165-1781\(02\)00266-4](https://doi.org/10.1016/s0165-1781(02)00266-4)
- Gudayol-Ferré, E., Peró-Cebollero, M., González-Garrido, A. A., & Guàrdia-Olmos, J. (2015). Changes in brain connectivity related to the treatment of depression measured through fMRI: A systematic review. *Frontiers in Human Neuroscience*, 9, 582. <https://doi.org/10.3389/fnhum.2015.00582>
- Harrison, P., Lawrence, A. J., Wang, S., Liu, S., Xie, G., Yang, X., & Zahn, R. (2022). The psychopathology of worthlessness in depression. *Frontiers in Psychiatry*, 13, 818542.
- Junghofer, M., Winker, C., Rehbein, M. A., & Sabatinelli, D. (2017). Noninvasive stimulation of the ventromedial prefrontal cortex enhances pleasant scene processing. *Cerebral Cortex (New York, N.Y.: 1991)*, 27(6), 3449–3456. <https://doi.org/10.1093/cercor/bhx073>
- Kautzky, A., Baldinger-Melich, P., Kranz, G. S., Vanicek, T., Souery, D., Montgomery, S., Mendlewicz, J., Zohar, J., Serretti, A., Lanzenberger, R., & Kasper, S. (2017). A new prediction model for evaluating treatment-resistant depression. *The Journal of Clinical Psychiatry*, 78(2), 215–222. <https://doi.org/10.4088/JCP.15m10381>
- Kraus, C., Kadriu, B., Lanzenberger, R., Zarate, C. A., & Kasper, S. (2019). Prognosis and improved outcomes in major depression: A review. *Translational Psychiatry*, 9(1), 127. <https://doi.org/10.1038/s41398-019-0460-3>
- McGaugh, J. L. (2004). The amygdala modulates the consolidation of memories of emotionally arousing experiences. *Annual Review of Neuroscience*, 27, 1–28. <https://doi.org/10.1146/annurev.neuro.27.070203.144157>
- McGorry, P. D., Nelson, B., Goldstone, S., & Yung, A. R. (2010). Clinical staging: A heuristic and practical strategy for new research and better health and social outcomes for psychotic and related mood disorders. *Canadian Journal of Psychiatry. Revue Canadienne de Psychiatrie*, 55(8), 486–497. <https://doi.org/10.1177/070674371005500803>
- Murphy, J. A., Sarris, J., & Byrne, G. J. (2017). A review of the conceptualisation and risk factors associated with treatment-resistant depression. *Depression Research and Treatment*, 2017, 4176825. <https://doi.org/10.1155/2017/4176825>

- Perlis, R. H. (2016). Abandoning personalization to get to precision in the pharmacotherapy of depression. *World Psychiatry*, *15*(3), 228–235. <https://doi.org/10.1002/wps.20345>
- Peters, S. K., Dunlop, K., & Downar, J. (2016). Cortico-striatal-thalamic loop circuits of the salience network: A central pathway in psychiatric disease and treatment. *Frontiers in Systems Neuroscience*, *10*, 104. <https://doi.org/10.3389/fnsys.2016.00104>
- Ridout, N., Astell, A., Reid, I., Glen, T., & O'Carroll, R. (2003). Memory bias for emotional facial expressions in major depression. *Cognition & Emotion*, *17*(1), 101–122. <https://doi.org/10.1080/02699930302272>
- Ruhé, H. G., van Rooijen, G., Spijker, J., Peeters, F. P. M. L., & Schene, A. H. (2012). Staging methods for treatment resistant depression. A systematic review. *Journal of Affective Disorders*, *137*(13), 35–45. <https://doi.org/10.1016/j.jad.2011.02.020>
- Souery, D., Amsterdam, J., de Montigny, C., Lecrubier, Y., Montgomery, S., Lipp, O., Racagni, G., Zohar, J., & Mendlewicz, J. (1999). Treatment resistant depression: Methodological overview and operational criteria. *European Neuropsychopharmacology*, *9*(12), 83–91. [https://doi.org/10.1016/s0924-977x\(98\)00004-2](https://doi.org/10.1016/s0924-977x(98)00004-2)
- Stange, J. P., Alloy, L. B., & Fresco, D. M. (2017). Inflexibility as a vulnerability to depression: A systematic qualitative review. *Clinical Psychology*, *24*(3), 245–276. <https://doi.org/10.1111/cpsp.12201>
- Stringaris, A., Vidal-Ribas Belil, P., Artiges, E., Lemaitre, H., Gollier-Briant, F., Wolke, S., Vulser, H., Miranda, R., Penttilä, J., Struve, M., Fadai, T., Kappel, V., Grimmer, Y., Goodman, R., Poustka, L., Conrod, P., Cattrell, A., Banaschewski, T., Bokde, A. L. W., ... IMAGEN Consortium. (2015). The brain's response to reward anticipation and depression in adolescence: Dimensionality, specificity, and longitudinal predictions in a community-based sample. *The American Journal of Psychiatry*, *172*(12), 1223. <https://doi.org/10.1176/appi.ajp.2015.14101298>
- Vogel, D., Krämer, K., Schoofs, T., Kupke, C., & Vogeley, K. (2018). Disturbed experience of time in depression-evidence from content analysis. *Frontiers in Human Neuroscience*, *12*, 66. <https://doi.org/10.3389/fnhum.2018.00066>

REFERENCES

- Askelund, A. D., Schweizer, S., Goodyer, I. M., & van Harmelen, A.-L. (2019). Positive memory specificity is associated with reduced vulnerability to depression. *Nature Human Behaviour*, *3*(3), 265–273. <https://doi.org/10.1038/s41562-018-0504-3>
- Assaf, M., Rabany, L., Zertuche, L., Bragdon, L., Tolin, D., Goethe, J., & Diefenbach, G. (2018). Neural functional architecture and modulation during decision making under uncertainty in individuals with generalized anxiety disorder. *Brain and Behavior*, *8*(8), e01015. <https://doi.org/10.1002/brb3.1015>
- Belleau, E. L., Treadway, M. T., & Pizzagalli, D. A. (2019). The impact of stress and major depressive disorder on hippocampal and medial prefrontal cortex morphology. *Biological Psychiatry*, *85*(6), 443–453. <https://doi.org/10.1016/j.biopsych.2018.09.031>
- Boeker, H., & Kraehenmann, R. (2018). Neuropsychodynamic approach to depression: Integrating resting state dysfunctions of the brain and disturbed self-related processes. *Frontiers in Human Neuroscience*, *12*, 247. <https://doi.org/10.3389/fnhum.2018.00247>
- Bottemanne, H., Baldacci, A., Muller, C., Boyreau, A., & Claret, A. (2022). Ketamine augmented psychotherapy (KAP) in mood disorder: User guide. *L'Encephale*, *48*(3), 304–312. <https://doi.org/10.1016/j.encep.2021.08.011>
- Bottemanne, H., Morlaas, O., Claret, A., Sharot, T., Fossati, P., & Schmidt, L. (2022). Evaluation of early ketamine effects on belief-updating biases in patients with treatment-resistant depression. *JAMA Psychiatry*, *79*, 1124–1132. <https://doi.org/10.1001/jamapsychiatry.2022.2996>
- Braunstein, L. M., Gross, J. J., & Ochsner, K. N. (2017). Explicit and implicit emotion regulation: A multi-level framework. *Social Cognitive and Affective Neuroscience*, *12*(10), 1557. <https://doi.org/10.1093/scan/nsx096>
- Bulteau, S., Grall-Bronnec, M., Bars, P.-Y., Laforgue, E.-J., Etcheverrigaray, F., Loirat, J.-C., Victorri-Vigneau, C., Vanelle, J.-M., & Sauvaget, A. (2018). Bipolar disorder and adherence: Implications of manic subjective experience on treatment disruption. *Patient Preference and Adherence*, *12*, 1355–1361. <https://doi.org/10.2147/PPA.S151838>
- Bulteau, S., Sauvaget, A., Vanier, A., Vanelle, J.-M., Poulet, E., Brunelin, J., & Sebille, V. (2019). Depression reappraisal and treatment effect: Will response shift help improve the estimation of treatment efficacy in trials for mood disorders? *Frontiers in Psychiatry*, *10*, 420420. <https://doi.org/10.3389/fpsy.2019.00420>
- Candlish, J., Teare, M. D., Cohen, J., & Bywater, T. (2019). Statistical design and analysis in trials of proportionate interventions: A systematic review. *Trials*, *20*(1), 151. <https://doi.org/10.1186/s13063-019-3206-x>
- Chevance, A., Ravaud, P., Tomlinson, A., Le Berre, C., Teufer, B., Touboul, S., Fried, E. I., Gartlehner, G., Cipriani, A., & Tran, V. T. (2020). Identifying outcomes for depression that matter to patients, informal caregivers, and health-care professionals: Qualitative content analysis of a large international online survey. *The Lancet Psychiatry*, *7*(8), 692–702. [https://doi.org/10.1016/S2215-0366\(20\)30191-7](https://doi.org/10.1016/S2215-0366(20)30191-7)
- Cole, E. J., Stimpson, K. H., Bentzley, B. S., Gulser, M., Cherian, K., Tischler, C., Nejad, R., Pankow, H., Choi, E., Aaron, H., Espil, F. M., Pannu, J., Xiao, X., Duvio, D., Solvason, H. B., Hawkins, J., Guerra, A., Jo, B., Raj, K. S., ... Williams, N. R. (2020). Stanford accelerated intelligent Neuromodulation therapy for treatment-resistant depression. *The American Journal of Psychiatry*, *177*(8), 716–726. <https://doi.org/10.1176/appi.ajp.2019.19070720>
- Collins, P. Y., Patel, V., Joestl, S. S., March, D., Insel, T. R., Daar, A. S., Scientific Advisory Board and the Executive Committee of the Grand Challenges on Global Mental Health, Anderson, W., Dhansay, M. A., Phillips, A., Shurin, S., Walport, M., Ewart, W., Savill, S. J., Bordin, I. A., Costello, E. J., Durkin, M., Fairburn, C., Glass, R. I., ... Stein, D. J. (2011). Grand challenges in global mental health. *Nature*, *475*(7354), 27–30. <https://doi.org/10.1038/475027a>
- Damasio, A. (2010). *Self comes to mind: Constructing the conscious brain*. Pantheon Books.

- de Sousa, G. M., Vargas, H. D. Q., Barbosa, F. F., & Galvão-Coelho, N. L. (2021). Stress, memory, and implications for major depression. *Behavioural Brain Research*, *412*, 113410. <https://doi.org/10.1016/j.bbr.2021.113410>
- El Haj, M., & Gallouj, K. (2019). Self-defining memories in normal aging. *Current Aging Science*, *12*(1), 43–48. <https://doi.org/10.2174/1874609812666190429130052>
- El Haj, M., Lenoble, Q., & Moustafa, A. A. (2022). The pupil and myself: Pupil dilation during retrieval of self-defining memories. *Neurological Sciences*, *43*(9), 5259–5265. <https://doi.org/10.1007/s10072-022-06163-z>
- El Haj, M., Nandrino, J.-L., Antoine, P., Boucart, M., & Lenoble, Q. (2017). Eye movement during retrieval of emotional autobiographical memories. *Acta Psychologica*, *174*, 54–58. <https://doi.org/10.1016/j.actpsy.2017.02.002>
- Fang, J., & Dong, Y. (2022). Autobiographical memory disturbance in depression. *Psychology, Health & Medicine*, *27*(7), 1618–1626. <https://doi.org/10.1080/13548506.2021.1916954>
- Gao, W., Chen, S., Biswal, B., Lei, X., & Yuan, J. (2018). Temporal dynamics of spontaneous default-mode network activity mediate the association between reappraisal and depression. *Social Cognitive and Affective Neuroscience*, *13*(12), 1235–1247. <https://doi.org/10.1093/scan/nyy092>
- Girardeau, J. C., Sperduti, M., Blondé, P., & Piolino, P. (2022). Where is my mind...? The link between mind wandering and prospective memory. *Brain Sciences*, *12*(9), 1139. <https://doi.org/10.3390/brainsci12091139>
- Godlewska, B. R., Norbury, R., Selvaraj, S., Cowen, P. J., & Harmer, C. J. (2012). Short-term SSRI treatment normalises amygdala hyperactivity in depressed patients. *Psychological Medicine*, *42*(12), 2609–2617. <https://doi.org/10.1017/S0033291712000591>
- Gustavsson, A., Svensson, M., Jacobi, F., Allgulander, C., Alonso, J., Beghi, E., Dodel, R., Ekman, M., Faravelli, C., Fratiglioni, L., Gannon, B., Jones, D. H., Jenum, P., Jordanova, A., Jönsson, L., Karampampa, K., Knapp, M., Kobelt, G., Kurth, T., ... CDBE2010Study Group. (2011). Cost of disorders of the brain in Europe 2010. *European Neuropsychopharmacology*, *21*(10), 718–779. <https://doi.org/10.1016/j.euroneuro.2011.08.008>
- He, C., Gong, L., Yin, Y., Yuan, Y., Zhang, H., Lv, L., Zhang, X., Soares, J. C., Zhang, H., Xie, C., & Zhang, Z. (2018). Amygdala connectivity mediates the association between anxiety and depression in patients with major depressive disorder. *Brain Imaging and Behavior*, *13*, 1146–1159. <https://doi.org/10.1007/s11682-018-9923-z>
- Hooley, J. M., Gruber, S. A., Parker, H. A., Guillaumot, J., Rogowska, J., & Yurgelun-Todd, D. A. (2009). Cortico-limbic response to personally challenging emotional stimuli after complete recovery from depression. *Psychiatry Research*, *172*(1), 8391.
- Kanter, J. W., Baruch, D. E., & Gaynor, S. T. (2006). Acceptance and commitment therapy and behavioral activation for the treatment of depression: Description and comparison. *The Behavior Analyst*, *29*(2), 161–185. <https://doi.org/10.1007/BF03392129>
- Korb, A. S., Hunter, A. M., Cook, I. A., & Leuchter, A. F. (2011). Rostral anterior cingulate cortex activity and early symptom improvement during treatment for major depressive disorder. *Psychiatry Research*, *192*(3), 188–194. <https://doi.org/10.1016/j.psychres.2010.12.007>
- La Corte, V., Ferrieux, S., Abram, M., Bertrand, A., Dubois, B., Teichmann, M., & Piolino, P. (2021). The role of semantic memory in prospective memory and episodic future thinking: New insights from a case of semantic dementia. *Memory*, *29*(8), 943–962. <https://doi.org/10.1080/09658211.2021.1936069>
- Laird, K. T., Krause, B., Funes, C., & Lavretsky, H. (2019). Psychobiological factors of resilience and depression in late life. *Translational Psychiatry*, *9*(1), 88. <https://doi.org/10.1038/s41398-019-0424-7>
- Langenecker, S. A., Jenkins, L. M., Stange, J. P., Chang, Y.-S., DelDonno, S. R., Bessette, K. L., Passarotti, A. M., Bhaumik, R., Ajilore, O., & Jacobs, R. H. (2018). Cognitive control neuroimaging measures differentiate between those with and without future recurrence of depression. *NeuroImage Clinical*, *20*, 1001–1009. <https://doi.org/10.1016/j.nicl.2018.10.004>
- Moutoussis, M., Fearon, P., El-Deredy, W., Dolan, R. J., & Friston, K. J. (2014). Bayesian inferences about the self (and others): A review. *Consciousness and Cognition*, *25*, 67–76. <https://doi.org/10.1016/j.concog.2014.01.009>
- Nejad, A. B., Fossati, P., & Lemogne, C. (2013). Self-referential processing, rumination, and cortical midline structures in major depression. *Frontiers in Human Neuroscience*, *7*, 666. <https://doi.org/10.3389/fnhum.2013.00666>
- Nolen-Hoeksema, S., Wisco, B. E., & Lyubomirsky, S. (2008). Rethinking rumination. *Perspectives on Psychological Science*, *3*(5), 400–424. <https://doi.org/10.1111/j.1745-6924.2008.00088.x>
- Northoff, G. (2007). Psychopathology and pathophysiology of the self in depression - neuropsychiatric hypothesis. *Journal of Affective Disorders*, *104*(1-3), 1–14. <https://doi.org/10.1016/j.jad.2007.02.012>
- Northoff, G., Heinzl, A., de Greck, M., Bermphohl, F., Dobrowolny, H., & Panksepp, J. (2006). Self-referential processing in our brain—A meta-analysis of imaging studies on the self. *NeuroImage*, *31*(1), 440–457. <https://doi.org/10.1016/j.neuroimage.2005.12.002>
- Notebaert, L., Grafton, B., Clarke, P. J., Rudaizky, D., Chen, N. T., & MacLeod, C. (2018). Emotion-in-motion, a novel approach for the modification of attentional bias: An experimental proof-of-concept study. *JMIR Serious Games*, *6*(4), e10993. <https://doi.org/10.2196/10993>
- Phillips, M. L., Chase, H. W., Sheline, Y. I., Etkin, A., Almeida, J. R. C., Deckersbach, T., & Trivedi, M. H. (2015). Identifying predictors, moderators, and mediators of antidepressant response in major depressive disorder: Neuroimaging approaches. *The American Journal of Psychiatry*, *172*(2), 124–138. <https://doi.org/10.1176/appi.ajp.2014.14010076>
- Phillips, W. J., Hine, D. W., & Thorsteinsson, E. B. (2010). Implicit cognition and depression: A meta-analysis. *Clinical Psychology Review*, *30*(6), 691–709. <https://doi.org/10.1016/j.cpr.2010.05.002>
- Piasecka, M., Papakokkinou, E., Valassi, E., Santos, A., Webb, S. M., de Vries, F., Pereira, A. M., & Ragnarsson, O. (2020). Psychiatric and neurocognitive consequences of endogenous hypercortisolism. *Journal of Internal Medicine*, *288*(2), 168–182. <https://doi.org/10.1111/joim.13056>

- Pimontel, M. A., Rindskopf, D., Rutherford, B. R., Brown, P. J., Roose, S. P., & Sneed, J. R. (2016). A meta-analysis of executive dysfunction and antidepressant treatment response in late-life depression. *The American Journal of Geriatric Psychiatry*, 24(1), 31–41. <https://doi.org/10.1016/j.jagp.2015.05.010>
- Pollock, L. R., & Williams, J. M. (2001). Effective problem solving in suicide attempters depends on specific autobiographical recall. *Suicide & Life-Threatening Behavior*, 31(4), 386–396. <https://doi.org/10.1521/suli.31.4.386.22041>
- Price, R. B., & Duman, R. (2020). Neuroplasticity in cognitive and psychological mechanisms of depression: An integrative model. *Molecular Psychiatry*, 25(3), 530–543. <https://doi.org/10.1038/s41380-019-0615-x>
- Price, R. B., Iosifescu, D. V., Murrrough, J. W., Chang, L. C., Al Jurdi, R. K., Iqbal, S. Z., Soleimani, L., Charney, D. S., Foulkes, A. L., & Mathew, S. J. (2014). Effects of ketamine on explicit and implicit suicidal cognition: A randomized controlled trial in treatment-resistant depression. *Depression and Anxiety*, 31(4), 335–343. <https://doi.org/10.1002/da.22253>
- Price, R. B., Spotts, C., Panny, B., Griffio, A., Degutis, M., Cruz, N., Bell, E., Do-Nguyen, K., Wallace, M. L., Mathew, S. J., & Howland, R. H. (2022). A novel, brief, fully automated intervention to extend the antidepressant effect of a single ketamine infusion: A randomized clinical trial. *The American Journal of Psychiatry*, 179(12), 959–968. <https://doi.org/10.1176/appi.ajp.20220216>
- Rock, P. L., Roiser, J. P., Riedel, W. J., & Blackwell, A. D. (2014). Cognitive impairment in depression: A systematic review and meta-analysis. *Psychological Medicine*, 44(10), 2029–2040. <https://doi.org/10.1017/S0033291713002535>
- Semkowska, M., Quinlivan, L., O'Grady, T., Johnson, R., Collins, A., O'Connor, J., Knittle, H., Ahern, E., & Gload, T. (2019). Cognitive function following a major depressive episode: A systematic review and meta-analysis. *The Lancet Psychiatry*, 6(10), 851–861. [https://doi.org/10.1016/S2215-0366\(19\)30291-3](https://doi.org/10.1016/S2215-0366(19)30291-3)
- Sendi, M. S. E., Zendeherouh, E., Sui, J., Fu, Z., Zhi, D., Lv, L., Ma, X., Ke, Q., Li, X., Wang, C., Abbott, C., Turner, J. A., Miller, R. L., & Calhoun, V. (2021). Aberrant dynamic functional connectivity of default mode network predicts symptom severity in major depressive disorder. *Brain Connectivity*, 11, 838–849. <https://doi.org/10.1089/brain.2020.0748>
- Sherman, B. E., Graves, K. N., Huberdeau, D. M., Quraishi, I. H., Damisah, E. C., & Turk-Browne, N. B. (2022). Temporal dynamics of competition between statistical learning and episodic memory in intracranial recordings of human visual cortex. *Journal of Neuroscience*, 42(48), 9053–9068. <https://doi.org/10.1523/JNEUROSCI.0708-22.2022>
- Sperduti, M., Arcangeli, M., Makowski, D., Wantzen, P., Zalla, T., Lemaire, S., Dokic, J., Pelletier, J., & Piolino, P. (2016). The paradox of fiction: Emotional response toward fiction and the modulatory role of self-relevance. *Acta Psychologica*, 165, 53–59. <https://doi.org/10.1016/j.actpsy.2016.02.003>
- Stuart, S. A., Butler, P., Munafò, M. R., Nutt, D. J., & Robinson, E. S. J. (2015). Distinct neuropsychological mechanisms may explain delayed- versus rapid-onset antidepressant efficacy. *Neuropsychopharmacology*, 40(9), 2165–2174. <https://doi.org/10.1038/npp.2015.59>
- Sui, J., & Humphreys, G. W. (2015). The integrative self: How self-reference integrates perception and memory. *Trends in Cognitive Sciences*, 19(12), 719–728. <https://doi.org/10.1016/j.tics.2015.08.015>
- Toda, T., Parylak, S. L., Linker, S. B., & Gage, F. H. (2019). The role of adult hippocampal neurogenesis in brain health and disease. *Molecular Psychiatry*, 24(1), 67–87. <https://doi.org/10.1038/s41380-018-0036-2>
- van Randenborgh, A., Pawelzik, M., Quirin, M., & Kuhl, J. (2016). Bad roots to grow: Deficient implicit self-evaluations in chronic depression with an early onset. *Journal of Clinical Psychology*, 72(6), 580–590. <https://doi.org/10.1002/jclp.22275>
- van Vreeswijk, M. F., & de Wilde, E. J. (2004). Autobiographical memory specificity, psychopathology, depressed mood and the use of the autobiographical memory test: A meta-analysis. *Behaviour Research and Therapy*, 42(6), 731–743. [https://doi.org/10.1016/S0005-7967\(03\)00194-3](https://doi.org/10.1016/S0005-7967(03)00194-3)
- Vanderhasselt, M.-A., Kühn, S., & De Raedt, R. (2011). Healthy brooders employ more attentional resources when disengaging from the negative: An event-related fMRI study. *Cognitive, Affective, & Behavioral Neuroscience*, 11(2), 207–216. <https://doi.org/10.3758/s13415-011-0022-5>
- Wagner, G., Schachtzabel, C., Peikert, G., & Bär, K.-J. (2015). The neural basis of the abnormal self-referential processing and its impact on cognitive control in depressed patients. *Human Brain Mapping*, 36(7), 2781–2794. <https://doi.org/10.1002/hbm.22807>
- Wagner, S., Helmreich, I., Wollschläger, D., Meyer, K., Kaaden, S., Reiff, J., Roll, S. C., Braus, D., Tüscher, O., Müller-Dahlhaus, F., Tadić, A., & Lieb, K. (2018). Early improvement of executive test performance during antidepressant treatment predicts treatment outcome in patients with major depressive disorder. *PLoS One*, 13(4), e0194574. <https://doi.org/10.1371/journal.pone.0194574>
- Whitfield-Gabrieli, S., Wendelken, C., Nieto-Castañón, A., Bailey, S. K., Anteraper, S. A., Lee, Y. J., Chai, X.-Q., Hirshfeld-Becker, D. R., Biederman, J., Cutting, L. E., & Bunge, S. A. (2020). Association of intrinsic brain architecture with changes in attentional and mood symptoms during development. *JAMA Psychiatry*, 77(4), 378–386. <https://doi.org/10.1001/jamapsychiatry.2019.4208>
- Wilkinson, S. T., Holtzheimer, P. E., Gao, S., Kirwin, D. S., & Price, R. B. (2019). Leveraging neuroplasticity to enhance adaptive learning: The potential for synergistic somatic-behavioral treatment combinations to improve clinical outcomes in depression. *Biological Psychiatry*, 85(6), 454–465. <https://doi.org/10.1016/j.biopsych.2018.09.004>
- Williams, J. M., Ellis, N. C., Tyers, C., Healy, H., Rose, G., & MacLeod, A. K. (1996). The specificity of autobiographical memory and imageability of the future. *Memory & Cognition*, 24(1), 116–125. <https://doi.org/10.3758/bf03197278>
- Williams, J. M. G., Barnhofer, T., Crane, C., Herman, D., Raes, F., Watkins, E., & Dalgleish, T. (2007). Autobiographical memory specificity and emotional disorder. *Psychological Bulletin*, 133(1), 122–148. <https://doi.org/10.1037/0033-2909.133.1.122>
- Wise, T., Marwood, L., Perkins, A. M., Herane-Vives, A., Joules, R., Lythgoe, D. J., Luh, W. M., Williams, S., Young, A. H., Cleare, A. J., & Arnott, D. (2017). Instability of default mode network connectivity in major depression: A two-sample confirmation study. *Translational Psychiatry*, 7(4), e1105. <https://doi.org/10.1038/tp.2017.40>

- Wu, G.-R., Wang, X., & Baeken, C. (2020). Baseline functional connectivity may predict placebo responses to accelerated rTMS treatment in major depression. *Human Brain Mapping, 41*(3), 632–639. <https://doi.org/10.1002/hbm.24828>
- Yoon, S., Dang, V., Mertz, J., & Rottenberg, J. (2018). Are attitudes towards emotions associated with depression? A conceptual and meta-analytic review. *Journal of Affective Disorders, 232*, 329–340. <https://doi.org/10.1016/j.jad.2018.02.009>
- Young, K. D., Siegle, G. J., Bodurka, J., & Drevets, W. C. (2016). Amygdala activity during autobiographical memory recall in depressed and vulnerable individuals: Association with symptom severity and autobiographical overgenerality. *The American Journal of Psychiatry, 173*(1), 78–89. <https://doi.org/10.1176/appi.ajp.2015.15010119>
- Yrondi, A., Sporer, M., Schmitt, L., & Arbus, C. (2018). Major depressive disorder: An organic disorder! *Presse Medicale (Paris, France: 1983), 47*(2), 113–115. <https://doi.org/10.1016/j.lpm.2017.12.005>

How to cite this article: Bulteau, S., Malo, R., Holland, Z., Laurin, A., & Sauvaget, A. (2023). The update of self-identity: Importance of assessing autobiographical memory in major depressive disorder. *WIREs Cognitive Science, 14*(3), e1644. <https://doi.org/10.1002/wcs.1644>