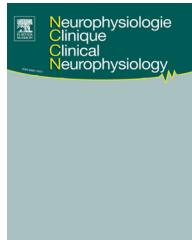




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REVIEW/MISE AU POINT

Brain circuits implicated in psychogenic paralysis in conversion disorders and hypnosis

Circuits cérébraux des paralysies psychogènes liées aux troubles de conversion et à l'hypnose

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Summary Conversion disorders are defined as neurological symptoms arising without organic damage to the nervous system, presumably in relation to various emotional stress factors, but the exact neural substrates of these symptoms and the mechanisms responsible for their production remain poorly understood. In the past 15 years, novel insights have been gained with the advent of functional neuroimaging studies in patients suffering from conversion disorders in both motor and non-motor (e.g. somatosensory, visual) domains. Several studies have also compared brain activation patterns in conversion to those observed during hypnosis, where similar functional losses can be evoked by suggestion. The current review summarizes these recent results and the main neurobiological hypotheses proposed to account for conversion symptoms, in particular motor deficits. An emerging model points to an important role of ventromedial pre-frontal cortex (VMPFC), precuneus, and perhaps other limbic structures (including amygdala), all frequently found to be hyperactivated in conversion disorders in parallel to impaired recruitment of primary motor and/or sensory pathways at the cortical or subcortical (basal ganglia) level. These findings are only partly shared with hypnosis, where increases in precuneus predominate, together with activation of attentional control systems, but without any activation of VMPFC. Both VMPFC and precuneus are key regions for access to internal representations about the self, integrating information from memory and imagery with affective relevance (in VMPFC) and sensory or agency representations (in precuneus). It is therefore postulated that conversion deficits might result from an alteration of conscious sensorimotor functions and self-awareness under the influence of affective and sensory representations generated in these regions, which might promote certain patterns of behaviors in response to self-relevant emotional states.

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MOTS CLÉS

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CPFVM

Résumé Les troubles de conversion sont définis comme des symptômes neurologiques apparaissant sans lésion organique du système nerveux, habituellement en relation avec des situations de stress émotionnel, mais les substrats cérébraux exacts de ces symptômes et les mécanismes responsables de leur apparition sont encore mal compris. Au cours des 15 dernières années, de nouvelles données ont été accumulées grâce au développement de la neuroimagerie fonctionnelle chez des patients souffrant de troubles de conversion moteurs ou non moteurs (par exemple somatosensoriel, visuel). Plusieurs études ont également comparé l'activation cérébrale lors de conversion à celle observée lors de l'hypnose, où des déficits fonctionnels similaires peuvent être induits par suggestion. Cette revue résume ces données et les principales hypothèses neurobiologiques proposées pour expliquer la genèse des symptômes de conversion, en particulier des déficits moteurs. Un aspect émergent important concerne le rôle potentiel du cortex préfrontal ventromédian (CPFVM), du précuneus, et peut-être d'autres structures limbiques (notamment les amygdales), tous fréquemment suractivés lors de troubles de conversion et associés à une altération de l'activation des voies motrices ou sensorielles élémentaires au niveau cortical ou sous-cortical (notamment ganglions de la base). Ces effets ne sont que partiellement partagés avec l'hypnose, où l'activation du précuneus prédomine, accompagnée d'une activation des systèmes de contrôle de l'attention, mais sans activation du CPFVM. Le CPFVM et le précuneus constituent deux régions cruciales pour l'accès à des représentations internes du soi, intégrant des représentations en mémoire avec leur valeur affective (CPFVM) et des informations sensorielles ou d'agentivité (précuneus). Ces données suggèrent que les symptômes de conversion pourraient refléter une altération des fonctions sensorimotrices et la conscience de soi sous l'influence de représentations affectives et sensorielles générées dans ces régions, favorisant l'expression de certains comportements en réponse à des états émotionnels particuliers et pertinents pour le soi.

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Introduction

Conversion disorders have been known to physicians since ancient times and consist of neurological dysfunction that occurs in the absence of organic lesions within the nervous system, but is distinct from other major psychiatric symptoms such as psychosis or depression. Thus, patients may present with a paralysis of one or more limbs, tremor or involuntary movement, anesthesia, blindness, deafness, or various other deficits, without any organic disease despite careful investigation and often signs suggestive of a non-organic/non-physiologic disruption of function [6,92]. Importantly, these symptoms are not intentionally produced in order to deceive physicians or obtain some direct material gain, but rather appear to result from a genuine belief or subjective experience of the patients that he/she is suffering from a particular disorder. While these symptoms were long labeled as "hysteria", this term has been replaced by "conversion" in modern psychiatric classifications of the 20th century. This change in terminology was partly due to increasing recognition that such problems could affect men as well as women, particularly after war episodes [7], but also reflected the major influence of Sigmund Freud [30], who proposed that these symptoms result from a transformation of a psychological conflict into symbolic physical manifestations due to repression in the unconscious (see other articles in this issue). However, although this diagnostic term is unique in psychiatry by directly referring to a specific causative mechanism, the exact causes and mechanisms underlying such conversion [2] of the psyche into the body actually still remain unclear and speculative. Furthermore, in the latest version of diagnostic criteria established

by DSM-5 in 2013 [4], the need to identify a particular psychological cause has been replaced by more general criteria implying significant distress or disability in normal activities due to the symptoms, a change that was motivated by the fact that psychological factors are often difficult to identify with certainty, or are found but with only weak or putative association with the diagnosis. In addition, it has been suggested that requiring the identification of explicit psychological factors acting on the patient's unconscious is not only difficult and unreliable in practice, but also inherently maintains a conceptual dualism between mind and body that does not fit with the current neuroscientific view, and that is generally not advocated for other mental diseases [4].

Uncertainties regarding the definition and cause(s) of conversion disorders are also reflected by the fact that they are classified in distinct diagnostic families in the DSM framework put forward by the American Psychiatry Association [2] and the ICD taxonomy established by the World Health Organization [65], being listed among somatoform disorders in the former but among dissociative disorders in the latter. Dissociation also refers to a dichotomy between conscious and unconscious processes dating back to the ideas of Janet in the late 19th century, which probably inspired Freud's conception of conversion, but this implies distinct psychodynamic mechanisms [89]. In addition, the role of dissociation in conversion disorders also remains hypothetical. Nevertheless, in the current state of psychiatric nosography, psychogenic motor or sensory losses are included in the same disease category as psychogenic amnesia according to the ICD (dissociative disorders) but in distinct categories according to the DSM. Finally, the relation of conversion disorders to other major psychiatric conditions is unresolved but a

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