Ⅰ期（一般・社会人）

受験番号		氏名	

令和 3 年度
武蔵野大学大学院　人間社会研究科　人間学専攻　言語聴覚コース　入学試験問題　（9 月 27 日）
［　英語　］　下記の英文を読んで、問いに答えなさい

Lesions have been used to infer localized substrates of brain function for a long time. The descriptions of two cases of profound loss of speech production by Paul Broca in 1861 provided one of the earliest and most suggestive examples of the link between a localized region of cerebral cortex and a specific cognitive function. Both of Broca's patients had lesions in approximately the same region of the left inferior frontal lobe, a finding that established an association between a circumscribed brain region and speech as a segregated mental faculty. The nature of brain damage in these patients was originally described as a relatively small and circumscribed surface lesion of cortex. ①However, a recent reexamination of the preserved brain with high-resolution MRI revealed much more widespread damage to cortical gray and white matter, including damage to more medial frontal areas and disruption of major corticocortical fiber pathways. ②Had the true extent of these lesions been known at the time, the interpretation of Broca's findings in terms of cortical localization might have been less compelling.

Other studies of anatomical lesions and their impact on cognitive and behavioral capacities cast doubt on ③the idea that the functional impact of cortical lesions could solely be attributed to the lost tissue. The British neurologist Hughlings Jackson advocated a careful consideration of nonlocal effects of lesions giving rise to aphasia, writing that "④destructive lesions cause loss of function of some nervous arrangements, and thereby over-function of others is permitted." Constantin von Monakow developed the concept of ⑤diaschisis to explain nonlocal effects of brain lesions. In 1914, he wrote the following:

> The generally accepted theory according to which aphasia, agnosia, apraxia, etc. are due to destruction of narrowly circumscribed appropriate "praxia, gnosia, and phasia centres" must be finally discarded on the basis of more recent clinical and anatomical studies. It is just in the case of these focal symptoms that concept of complicated dynamic disorders in the whole cortex become indispensable.

The precise definition of this concept turned out to be a great challenge that was not easily met given the anatomical and physiological knowledge of the time. Consequently, nonlocal concepts for "action at a distance" like diaschisis lacked a solid mechanistic foundation and could never quite dispel the uncertainty surrounding the variable and unpredictable effects of brain lesions on behavior.

The study of the anatomical substrates of aphasia, almost from its very beginnings, revealed that speech results from associative linkages between several cortical centers. Carl Wernicke and Ludwig Lichtheim developed some of the first "network models" of a higher cognitive function. Their work revealed that speech depends on the integrity of corticocortical pathways as well as on the cortical gray matter. Building in part on these early models of "conduction aphasia," Norman Geschwind formulated a theory of "⑥disconnection syndrome" that attributed numerous cognitive deficits to damage of association pathways, either within or between the cerebral hemispheres. Today, ⑦the development and refinement of diffusion MRI enables the detection and mapping of such disturbances with unprecedented resolution. Modern methodologies strongly support the idea that the significance of a lesion is increasingly determined not only by the local function but also by the connectivity pattern of the lesioned brain area.

Cognitive and behavioral effects of brain lesions are highly variable, and their mechanistic origins, despite the efforts of von Monakow, Geschwind, and others, remain difficult to discern. Effects of lesions include damage to structural brain networks, as well as a subsequent impact on functional brain network that extends across time. In patients, the immediate impact of the lesion followed by a complex time course of brain reorganization and functional recovery. In many cases, the remarkable plasticity of the nervous system allows for substantial long-term improvement and sometimes complete restoration of functional deficits. These recovery processes represent a major challenge to network theories of the brain as they are the result of a complex interplay of physiological and behavioral processes and possibly deploy "brain reserve" to increase network resilience. Despite these complex structural and functional substrates, lesions of specific brain regions are often associated with specific cognitive and behavioral disturbances, and lesions of some area tend to have more widespread effects than others.

Brain lesions are perturbations of structural brain network that have physiological effects. Some of these effects are the direct consequence of the loss of nodes and edges while other effects involve the disruption of functional interactions between nonlesioned structures. Studies of functional brain networks in patients with specific cognitive deficits support this model. For example, He et al. examined BOLD functional connectivity in patients with spatial neglect following a stroke in the right cerebral hemisphere. Acute disruption of functional connections within a network of brain regions involved in spatial attention outside of the primary lesion location are strongly correlated with an impairment of attentional processing. ⑧These results support a network approach to understanding complex neurological disorders such as spatial neglect and document the contribution of nonlocal lesion effects to disruption of behavior and cognition. Hence, explanations of lesion effects cast exclusively in terms of local information processing in the lesioned area are at best incomplete.

（Olaf. Sporns, Netwrks of the Brain より）

＜語彙＞

circumscribed：限局的な、segregated：特定の、a great challenge：大きな難問、dispel：晴らす、integrity：完全であること、unprecedented：これまでになかった程の、discern：明らかにする、deploy ：展開する、perturbation：動揺、混乱、nodes and edges：ノード（節）とエッジ（枝）; データを表現するグラフにおける点と線のこと、BOLD functional connectivity：血中酸素濃度に依存する機能結合、document：根拠を示している

問 1. 下線部①を和訳しなさい。（100 字程度）

問 2. 下線部②を if を用いた句に書き換えなさい。

問 3. 下線部③について「～という考え」に続くように和訳しなさい。（40 字程度）

問 4. 下線部④について、具体的な神経心理症状を挙げなさい（最低１つ）。

問 5. 下線部⑤の神経心理学用語について、本文の内容を参考に説明しなさい。（40 字程度）

問 6. 下線部⑥の神経心理学用語について、和訳を書きなさい。

問 7. 下線部⑦に該当する脳画像処理の通称を述べなさい。

問 8. 下線部⑧を和訳しなさい。（100 字程度）