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Assess Fodor's Modularity Hypothesis with Reference to Human Language Faculty

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Introduction

Fodor [1] proposed that mind may be internally structured of mental modules with distinct functions. He argued for the modularity of "lower level" cognitive processes in input–output systems for perceptual faculties like vision and language, and these modules are characterised but not defined by a set of properties, of which the informational encapsulation is especially important. He also argued for non-modular central processes for integrative higher faculties. This modularity hypothesis has a close relation to Chomsky [2]'s modular language faculty theory and they have both resonances and divergence that will be discussed in this essay. The focus will be on "information encapsulation, non-modular central system, and assembledness".

The Real Signature of Modularity: Information Encapsulation

The property of information encapsulation stands out as the real signature of a module, which blocks cognitive influence and access [3]. For example, conscious awareness that Müller-Lyer illusion is an illusion cannot correct visual processing [4]. And indeed many rigorous language experiments use this property to evaluate the relevant modularity, which shows encapsulation's prominence. For example, [5] found the phonetics perception not influenced by signal belief; [6] proved that speech perception is independent of other modules especially auditory influence. [7-9] respectively confirmed that lexical access, phonology, and syntax are informationally encapsulated.

However, there is disagreement from [10] that the syntactic structure building process appears not to be informationally encapsulated. But ambiguity always involves semantic matching so it is very possible that syntactic processing finishes first very quickly and then the central system process it with visual context, semantics understanding, and real-life experience. Less convincing is that this experiment only set the one-two referent's contrast to "apple" but not "towel", which can be misleading. On the other hand, as [7] said, the suggestion that lexical access is a "bottom-up" process is not at all to claim that this accessed information does not interact with other information. And other perception penetration can be understood as the influence on the activation level of a module. The internal execution process of the module is not affected by the infiltration of external information, but as a mechanism, its operation also depends on the excitation or inhibition of other conditions [11]. Moreover, the information encapsulation is consistent with high-speed computer processing [12].

[13] Effect-the mixed phonological perception-is another counter-example of information encapsulation. But this cannot deny its existence. Strong and weak gradients can help explain, that is to say, different modules may have different degrees of property strictness. However, "gradient" and "interaction" cannot be used to explain anything, otherwise, the module may lose independence and thus not be a module. After talking about the peripheral system, let's discuss the central system next.

Possibility of a Modular Central Processing System

It is better to retain the possibility that central processing system is modular. [11] claimed that central processes with abductive inference are neither encapsulated modules nor any computational system. Inevitably, several crucial questions are left. Firstly, now that the central part, the essence of mind is not modular, then what is modularity's significance and value in the long run [14]? Secondly, Fodor asserts that central processing would be unsuitable for scientific research. Then it can be expected that the more holistic a cognitive process is, the less likely people understand it, which would lead to research pessimism. Thirdly, Quineian and isotropic characteristics of the central system are related to the domain (about the system input, not the information closure), which means a belief may be reciprocated in a modular way with beliefs in other domains. In this way, the central process computation could integrate the information while maintaining the encapsulation nature [15]. And abductive inference may be a modular process of a special domain.

There are also some thoughts that "central" systems can't be modular because they "flexibly" use data from sources to produce outputs

depending on the context. Concerning the language architecture: processes involving global principles like relevance, such as pragmatic comprehension of speech acts [16], appear to be examples where modularity must be ruled out. Analogy, metaphor, and counterfactual reasoning are all hallmarks that would be subject to similar arguments [17]. However, there is still the absence of evidence proving the complete non-modularity of the central system.

On the other hand, some evolutionary/massive modularity supporters state that modules are used for central processing. They describe the mind as massively modular [18-21]. And most Post-Fodorian theorists such as [22-24] suggest that the mind is modular through and through, up to and including the high-level cognitive systems and module-like "central" mechanisms. But there are also difficulties with such a position. The first is the Pan-Modular which will cause the using chaos of modularity. Second, there is little empirical support in favor of the massive modularity including central system [25], and evolutionary module conclusions use untested evolutionary assumptions [26].

In addition, when recalling Noam Chomsky's theory of the innate language module, it's found that Chomsky has distanced himself from Fodor primarily because Chomsky has ideas about how the central system could be modularized but Fodor says it is incomprehensible [27]. The most obvious proof appears to be compensatory function of the brain after injury, and the non-interconnection of various core competencies, e.g. people suffering brain damage forget how to speak can still play chess or anything like that. Therefore, although the defenders of both extreme peripheral and massive modularity possibly don't qualify, it is better to keep the possibility of modularity, otherwise, some language comprehension processes like pragmatics will never be figured out in essence.

Modules Could be Assembled

The non-assembledness existed in Fodor's list of features of modularity but disappears later. Fodor gave no reason for this, which shows his uncertainty about this question, and Fodor also has not given a good explanation for the complex internal structure of the module. Modules are very likely to be assembled. First of all, [28]'s conception of the faculty of language as a specific system and subsequent theories are not consistent with non-assembledness, because every computational module realizes an intentional module [29] and generative linguistics basically regards core linguistic components (syntax, phonology, semantics) as computational-intentional modules [30]. And linguistic investigations from [7-9] (mentioned in para.2) have indirectly confirmed the modularity of lexical access, phonology, and syntax from the aspect of encapsulation. In other words, the faculty of language as a module itself has been put together from some stock of more elementary modular subprocesses. And it seems that different linguistic modules' properties are empirical questions worth trying and proving.

[31] proposed that there are encapsulated computing mechanisms corresponding to different domains in the module and [1] gave examples of within-module interlevels of representation: phonetic vs lexical, visual vs abstract letter, form concept vs 3-D sketch. Then it is natural and reasonable to view these distinct domain-specific subsystems as modules. Take the language module as an example, why don't we say there is a lexical-form module and a phonetic-analysis module? This has also been shown by [32,21]: module could be decomposed and decomposition stops when all components are primitive processors; For Prinz, when considered individually, Fodor's criteria are applied to a fragmented and diverse array of subsystems.

Although the above rational assumptions lack evidential studies, let us reason along with these assumptions: if modules can be assembled, then one question is whether information flow in system is merely feedforward (bottom-up) or whether feedback (top-down processing, recurrence, interactive activation) also happens. I think for each module, this is just a matter to be decided empirically because even with interactive activation, it would not violate encapsulation and the basic concept of modularity. And there is nothing odd about modules using different flow patterns [33]. Overall this part is an analytical look at the rationality of assembled modules (which is often overlooked).

Conclusion

[1] Made it clear that he was simply suggesting a set of system properties for the module, not claiming the necessity of them. But there is an especially important and outstanding property -information encapsulation –which can be seen as the real signature of modularity. And this has been certified through language experiments and observations. It is necessary to keep the modular central system possible and prevent both extremes from peripheral and massive modularity. As Chomsky said, the central processing is not so inscrutable and can be modular to some extent. But we should also realize that part of [1] intuition is right. Because compared with the progress of perception and language research, research on high-level cognition such as problem-solving is exactly lagging. But with PET, fMRI, and other imaging advances in technology, linking specific aspects of high-level cognition to patterns of brain activation, will allow us to learn more about how high-level systems process and function. Modules are very likely to be assembled reagrding studies based on the language faculty relevant theories. Analysis of other modules like visual and auditory also support this view. In summary, despite many remaining problems and lack of modern neuroscientific evidence, we can't easily deny the great explanatory function of the Fodor's modularity hypothesis which offers valuable theoretical insights and interesting examples.

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