

The inner speech of the IDyOT  
Comment on “Creativity, information, and  
consciousness: The information dynamics of thinking”  
by Geraint A. Wiggins<sup>☆</sup>

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Wiggins [12] presents IDyOT as a model of dynamic system of thinking. However, IDyOT is, by and large, an open-loop system, while a dynamic system should highlight the feedback loops between the outputs and the inputs of the system.

5 Now, referring to Fig. 2 of [12], a feedback loop may be built by processing the output of the “Phrase space” in IDyOT and sending it back in input to the “Audio space.” The effect of the loop is the generation of a kind of inner speech. Then, a first inner speech act may induce subsequent inner speech acts, thus generating an effective dynamics of thinking.

10 Inner speech is tightly linked to thought, as claimed by Sokolov [9] in his seminal book (see also Carruthers [3], Jackendoff [6], among many others), and then it should be an essential ingredient in IDyOT.

According to Alderson-Day and Fernyhough [1], talking to herself enables a person to pay attention to internal and external resources, to control and  
15 regulate her behavior, to retrieve memorized facts, to learn and store new information and, in general, to simplify otherwise demanding cognitive processes.

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Thus, inner speech may be necessary for IDyOT.

Moreover, inner speech may restructure the perception of the world and the self by enabling high-level cognition, including self-control, self-attention, and self-regulation.

It is true that inner speech cannot be directly observed, thus making difficult the scope for empirical studies. However, theoretical perspectives are developed during the last decades and are recognized in research communities.

Vygotsky [11] considers inner speech as the outcome of a developmental process during which the linguistics interactions between the child and the caregiver are internalized. The linguistically mediated explanation for solving a task thus becomes an internalized conversation with the self when the learner is engaged in similar cognitive functions.

Morin [7] claims that inner speech is linked to self-awareness. Self-focusing on internal resources triggers inner speech, and it generates self-awareness about such resources. Other hypothesized sources for the self-focus process are the social interactions or even the mirror reflections by physical objects.

The seminal paper by Baddeley [2] discusses the roles of the modules in the working memory responsible for inner speech rehearsal. In particular, the central executive oversees the process; the phonological loop deals with spoken and written data, and the visuospatial sketchpad deals with information in a visual or spatial form. Then the phonological loop rehearses and stores verbal report from the phonological store. It is to be noticed that these ingredients are already present in IDyOT.

Steels [10] argues that language re-entrance allows refining the syntax emerging during oral interactions within a population of agents. The syntax then becomes complex and complete thanks to the parsing of previously produced utterances by the same agent.

Clowes [4][5] discusses an artificial agent implemented by a recurrent neural network whose output nodes are words interpreted as possible actions. When such words are re-entrant by back-propagating the output to the input nodes, then the agent achieved the task in far fewer generations than in the control

condition where words are not re-entrant.

It would be interesting to test whether effects similar to the ones described  
50 by Steels and by Clowes may be observed in IDyOT.

Recently, Pipitone et al. [8] discuss a cognitive architecture for robot inner  
speech that has some contact points with IDyOT. Briefly, the working mem-  
ory system of the robot includes the phonological loop as the main component  
for storing spoken and written information and for implementing the cognitive  
55 rehearsal process. The covert dialogue is modeled as a loop in which the phono-  
logical store hears the inner voice produced by the hidden articulator process.  
The central executive is the master system which drives the whole system. By  
retrieving linguistic information from the long-term memory, the central exec-  
utive contributes to creating the linguistic thought whose surface form emerges  
60 by the phonological loop.

In summary, all the necessary ingredients for the generation of inner speech  
are already present in IDyOT. Therefore, a critical test bench is the analysis of  
the impact of inner speech capabilities in the memory structures of the model.

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