COGNITIVE MECHANISM & SYNTACTIC THEORY

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Abstract: This paper as a compulsory assignment in Psycholinguistics subjects describes and explains the theories which purposed by Boland (2005a) . In the article, there is a long explanation and example case that proved that cognitive psychology and formal linguistics cannot give significant affects one to another as the experts expected. The conclusion is most psycholinguistic data is unrelated with formal linguists' theory. Then there will be a brief example that should be considered to support the statement.

Keywords: Psycholinguistics, Cognitive Mechanism, Syntactic Theory.

Introduction

The beginning of this paper there will be discussion about the domain of cognitive psychology and the formal linguistic theory. It will continue with explanation about both linguistics analyses as product of formal linguistic theory and mental structure as the area of cognitive psychology. The next part, there will be depth details of both domain which are the human parsing system as cognitive psychology activity and grammatical operation in formal linguistic theory. Finally, the case study between the arguments and adjunct will be the main discussion in order to find the evidence of the author statements before about the lack of substantial relation between formal linguistic theory and the cognitive psychology.

Cognitive Psychology vs. Formal Linguistic Theory

Both two terminologies derive from different disciplines. Cognitive psychology represents psychology and formal linguistic theory comes from linguistics. Both two disciplines was united in a seminar held by Cornell University in 1951, that was supposed as the birth of psycholinguistics as reported by (Warren, 2013: 6) which are concerning the research through the evidence and phenomena in both psychology and linguistics,

psycholinguistics is apt to composite the theoretical and descriptive fact of linguistics with the experimental and objectivity of psychology.

Highlighted by Boland (2005a: 23), Cognitive psychology involves the study of mental representation and the mental operational for deploying these mental representations by doing internal process as attention, perception, learning, memory, language, problem solving, reasoning, and thinking. It is similar with Eysenck and Keane (2010) description about cognitive psychology that it is concerning the effort to understand human cognition by observing the people's daily behavior in doing numerous mental activities. For instant, the research which is conducted by a cognitive psychologist to a certain mental behavior in orders to develop such kind of theory about syntactic parsing within sentences comprehension and to investigate what types of internal process are elaborated.

Based on Chomsky (1965: 3), Linguistic theory is emphasized with an ideal language interaction without bothered by inappropriate grammatical situations as memory limitations, distractions, shifts of attention and interest, and errors (random or characteristic) in language knowledge in daily performance. Thus the theory has two major points; the first is competence as the possession of language knowledge and the second is performance as the real usage of language in actual conditions. The aim of the formal linguistics theory is to improve the simplest and effective description of language knowledge for instant grammar. Theories describe the characterization of human mind that can produce the language without ignoring the facts about it. Furthermore, the competence of language should fulfill the requirement of those expressions that approved by the native speaker.

Between cognitive psychology and formal language theory, they have their own starting point in investigating the language phenomena. Formal linguistics theory gives spaces of language processing subcomponents (phonetics, phonology, morphology, syntax, etc.); terms that defines the mental representation in language processing (noun phrase, empty category, thematic role, etc.) and the theories of the language organizations (such as x-bar theory, categorical grammar, etc.). While cognitive psychology offers the methodologies in order to examining the conceptual process of acquisition, comprehension, and production (Boland, 2005a: 24).

Moreover, in the level of syntax, there is an adequate example in investigating the relationship between cognitive psychology and formal linguistics theory. It is occurred in process of the syntax construction which has involved human parsing system, which is the area of cognitive psychology and the grammar that represents formal linguistics theory (Boland, 2005a: 24). The human parsing system operates incrementally, analyzing syntactic structure in real time as each word is heard or read. The operation of the parser is subject to performance constraints such as limitations on working memory and the time necessary to complete mental operations. Grammatical operations do not occur in real time even though they may constitute an ordered sequence of representations and working memory is irrelevant.

The main point that makes different between psycholinguists and linguistics is the concept of comprehension in the parsing system and the concept of production in grammar system. Moreover researcher or observer mostly focused in knowledge of the language with ignoring the mental process in understanding or producing an utterance. In some case, psychological finding that an item-based mechanism is able imitate rule-governed behavior is not sufficient to remove rules in linguistic theory. In difference, psychological finding that the necessary knowledge is not definite within the lexicon does highly recommended the use of a general rule (Boland, 2005a: 27). For an example of psychological records of the latter type, deliberate the linguistic distinction between arguments and adjuncts.

Arguments vs. Adjuncts

In formal theories of syntax and psycholinguistic theories of parsing, a distinction between arguments and adjuncts is fundamental to some concepts, while lessened or even repudiated by some else (Tutunjian & Boland, 2008: 631). There is a lot of effort in parsing while distinguish between arguments and adjuncts, since it is believed that the semantic differences between them are useful in designing procedures for extracting information from sentences.

There is a need to distinguish between arguments and adjuncts. In the example sentence, *John quickly cooked the fish for his cat*, the subject *John* and the object *fish* are *arguments*. The verb *cook* requires that there is someone cooking and something being

cooked, so these two arguments are part of the sense of the verb *cook*. They are more or less essential to its meaning. Arguments are usually, but not always, determiner phrases (DPs) rather than noun phrases (NPs) (Janda, 2000: 302).

Nevertheless, there is another class of constituents, called *adjuncts*, which contrasts with arguments. Adjuncts add information, but they are not an essential part of the meaning. In our example, neither *quickly* nor *for his cat* is an argument of *cook*. They simply give us more detail about the background or circumstances. Adjuncts are often adjective phrases (Aps) or preposition phrases (PPs) (Emonds, 2000: 72).

While the argument/adjunct difference figures obviously in many linguistic and psycholinguistic theories, there have been challenges to redesign the peculiarity or even to remove it entirely. Based on Chomsky (1995: 82) report, adjuncts and arguments behave somewhat differently with regard to extraction from barriers. If they were drawing in constituency tree, it can be stated that Arguments are sisters to the head, while adjuncts are sisters to a phrasal node as *figure 1* below. Furthermore Boland (2005a: 27) suspected that Arguments are lexically specified and adjuncts are not, processing evidence may be able to distinguish the difficult cases. There is need psychological evidence that adjuncts are not lexically specified.

adjunct to a VP with an argument

adjunct to a VP with no argument

Figure 1. Constituency Tree of Arguments and Adjuncts (Carnie, 2012)

The argument/adjunct contrast may be a situation in which psycholinguistic data is more informative than intuitive data. There are at least two controversies within formal linguistic theory that psycholinguistic data may speak to. The first is whether there is in fact any distinction between the lexical specification of arguments and adjuncts. Secondly, if such a distinction is to be maintained, psycholinguistic data may help resolve the debate over problematic cases such as instrument PP's (Preposition Phrases). Argument status can be diagnosed by the presence/absence of a certain type of lexical frequency effect (Boland, 2005a: 28).

In psycholinguistics viewpoint, Boland (2005a: 29) assumed many of the expectations of constraint-based lexicalist theories of sentence processing. Much of syntactic knowledge is stored lexically and accessed via word recognition and syntactic structures are constructed incrementally during sentence comprehension, and that new constituents are attached to the developing structure through competition between lexical choices. It gives an assumption that more frequent meanings of semantically ambiguous words are accessed more easily than less frequent meanings, so more frequent syntactic forms are accessed more easily.

Figure 2. Alternative syntactic forms of *delegate* and *suggest* (Boland, 2005a: 29).

The following example, both *delegate* and *suggest* can head either a dative or a simple transitive structure, but the dative form is relatively more frequent for *delegate*. In *figure 2*, circle trees describe the structure that used by students more frequently than other option. Lexicalized versions of both structures are retrieved by acknowledgement of either verb, but prejudiced by frequency. In *figure 3*, Argument slots are represented in the lexical entries of their heads, but adjunct slots are not, only arguments could be attached using the unified-tree mechanism. The higher portion of the figure demonstrates a lexical unification mechanism for argument attachment. The lower portion of the figure illustrates that same mechanism cannot be used for adjunct attachment if adjunct slots are not lexically specified by the head (i.e., *change*). The prediction of argument phrases will be treated contrarily than adjunct phrases should be consider as an arguments structure hypothesis which appropriate with linguistics theory.

Arguments (unify trees)

Adjunct (need rule)

Figure 2. Alternative syntactic forms of arguments and adjuncts (Boland, 2005a: 30)

Argument Structure Hypothesis with Reading Paradigms

The presence/absence of a certain type of lexical frequency effect can be the indication of arguments status as suggested by (Boland, 2005a: 30). Distinguishing lexical frequency effects from plausibility effects raises difficulty in testing this Argument Structure Hypothesis that might affect dependent measure, for instance reading time on the phrase of interest. This part will be discussing the finding of the research based on both cognitive psychology and formal linguistics theory in platform of reading paradigms. The research that would be consider such as findings in Spivey-Knowlton and Sedivy (1995) and recommend for clarification which is obtainable from Boland, Lewis, and Blodgett (2004).

It is had been reported by Spivey-Knowlton and Sedivy (1995) that by using stimulant sentence *The mechanic changed a tire...* and gave the option in the rest of sentence that are *...with a faulty paper* and *...with a monkey wrench*, they found that the responder read *...with a monkey wrench* as verb phrase (VP)-attached adjuncts were read more quickly than with *...a faulty valve* as noun phrase (NP)-attached adjuncts following an action verb, whereas opposite configurations was found for perceptions verbs *with*. From the sentence, it might appeared more suitable to say what or who the tire was changed with, rather than to extra describe the tire as being one with some property.

This evidences configuration might signify a lexical frequency effect, with the co-occurrence frequency between the adjunct and its lexical head manipulating the simplicity of attachment (Boland, 2005a: 31). It establishes that PP adjuncts are lexically specified, opposing to the Argument Structure Hypothesis. However, another explanation is based upon dissimilarity in local plausibility. In difference, for the psych/perception verb example, perceiving with someone or something is fewer reasonable than description by some property that can be uttered in a with-PP. The plausibility account is dependable with the Argument Structure Hypothesis, because both NP-attached and VP-attached adjunct selections could be produced by rule rather than lexically specified.

The lexical frequency hypothesis was experimented to define whether the adjuncts were in detail lexically specified by Boland et al. (2004) without using any reliant ration

that make available a pure index of lexical frequency effects, sterilized by other variables. But it is potential to distinguish lexical frequency effects from other influences on reading time since lexical frequency has a restricted position in manipulating syntactic analysis: lexical frequency, but not plausibility, creates the initial generation of syntactic structure(s), while both lexical frequency and plausibility creates syntactic ambiguity resolution, whereas it keeps a distinction between the generation of syntactic structure and assortment procedures that activate when multiple grammatical structures are conceivable. The distinction between the generation of syntactic structure and syntactic ambiguity resolution is obvious in certain parsing theories.

The statement that the lexical frequency effect arises because access to the competing argument structures is weighted by relative frequency was confirmed by Boland et al. (2004: 18) that by using both self-paced, phrase-by-phrase reading and eye-fixation measures. It is conflicting with Spivey-Knowlton and Sedivy (1995: 254) findings that verb-class effects, which we believe to be pragmatically driven, were most robust in the later dependent measures, while the lexical-frequency effects for our dative-PP arguments were most robust in the earliest dependent measures. It is originate that lexical frequency effects in argument attachments, but not adjunct attachments rises a suggestion that arguments are attached using detailed lexical information that is weighted by frequency, while adjuncts are attached using more global syntactic knowledge. The distinction between the argument and adjunct stimuli observed by Boland et al. (2004) proposes that the PP's supposed to be adjuncts, including the instrument PP's, are not lexically specified by the verbal heads. It should be deliberated, along with traditional linguistic tests, when assessing the argument status of instrument PP's.

Implicit Arguments in Listening Paradigms

At least there are two consequences of lexical specification of arguments based on the report by Boland (2005a: 35). They are frequency effects and the access to provide recognition of a lexical head to the thematic roles associated with frequently occurring arguments. This fact is maintained by reading experiments that have confirmed that

verbs implicitly introduce their arguments into the discourse, without the arguments being explicitly declared. This Joining evidence can be set up within a listening paradigm.

There is a tendency while in listening program, the listeners look at things as they are mentioned if the mentioned items are in the visual setting. This occurrence extends to items that have not been clearly mentioned yet. In its place of waiting for audio confirmation that the target object is being mentioned, listeners used the in progress visual context or they made an eye movement to an appropriate instrument. Even though no instrument was mentioned, listeners used their knowledge about the two verbs to decide. It means that the concern that the eye-movement patterns are caused by strategies the listeners adopt to guess were used to pro-actively restrict the domain of subsequent reference. Additionally in a passive listening task, it is hard to recognize the cause of the anticipatory fixations, because both linguistic and general world knowledge could have contributed to the effect (Boland, 2005a: 36).

There is question rises that whether the discourse elements that can be presented by a verb are limited to members of its thematic grids or whether a verb's arguments hold a privileged status or are all related words and perceptions accessed in similarly. Across three experiments by using a passive listening paradigm, effects of both argument status and real world knowledge were found by Boland (2005b: 267).

Moreover, in the first experiment, the argument structure of the dative verbs presented an abstract recipient, but there was only one potential referent pictured—the same one that was explicitly mentioned. A second experiment used the same sentences, but presented both typical and atypical targets (the recipients, instruments or locations) on each trial. This experiment produced clear typicality effects, suggesting that when more than one potential referent is pictured, real world knowledge is used to focus attention on the most appropriate referent. This account is consistent with prior evidence that pragmatic constraints influence ambiguity resolution, but not the generation of linguistic structure (Boland, 1997: 476).

The result of the research above reveals that linguistic constraints show a significant part in controlling visual attention in this passive listening paradigm. Furthermore, these argument status effects propose an important distinction between adjuncts and arguments in terms of how verbs introduce entities into the discourse. A verb

infers its arguments, but not adjuncts, before they are clearly mentioned. Therefore, these outcomes propose additional investigational examination of argument status.

Conclusion

Psycholinguistic facts and information from cognitive neuroscience for that substance will always take a subordinate part in formal linguistic theory, refereeing between linguistic theories that are similarly well-designed and explain for the traditional data which are linguistic intuitions from a variety of languages, fit correspondingly. Psycholinguistic research cannot decide decently structural discussions about the geometry of the phrase structure tree or the nature of a derivation within syntactic theory, because these concepts do not create sincere calculations about processing.

The psycholinguistic emphasis on arguments and adjuncts in the discussion above is apparently encouraged by the argument/adjunct distinction in formal linguistic theory. Psychologists who study sentence comprehension rely on linguistic theory and Formal linguists don't often attempt to explain for occurrences that psychologists see about the mental representations involved in language processing. This may be because formal linguistics has slight to gain from cognitive psychology under weak transparency assumptions.

Reading and listening paradigms results congregate to maintenance the understanding that arguments and adjuncts have a contradictory position in parsing. In the listening tests concluded that verbs indirectly presented their arguments, but not adjuncts, and visual attention was drawn to possible referents of those arguments. This is to be projected if only arguments are signified in the lexical entries of their heads. In the reading tests concluded that there were lexical frequency effects for PP arguments but not PP adjuncts, proposing that only the arguments were syntactically analyzed using a lexicalized mechanism.

References

- Boland, Julie E. (1997). The Relationship between Syntactic and Semantic Processes in Sentence Comprehension. *Language and Cognitive Processes*, 12(4), 423-484.
- Boland, Julie E. (2005a). Cognitive Mechanisms and Syntactic Theory. In A. Cutler (Ed.), *Twenty-First Century Psycholinguistics: Four Cornerstones* (pp. 23-44). New Jersey: Lawrence Erlbaum Associates, Inc.
- Boland, Julie E. (2005b). Visual arguments. *Cognition*, 95(3), 237-274.
- Boland, Julie E, Lewis, Richard L, & Blodgett, Allison. (2004). Distinguishing Generation and Selection of Modifier Attachments: Implications for Lexicalized Parsing. *Manuscript Submitted for Publication*.
- Carnie, Andrew. (2012). *Syntax : a generative introduction*. Chichester: Wiley-Blackwell.
- Chomsky, Noam. (1965). *Aspects of the theory of syntax*. Cambridge,: M.I.T. Press.
- Chomsky, Noam. (1995). *The Minimalist program*. Cambridge, Mass.: The MIT Press.
- Emonds, J.E. (2000). *Lexicon and Grammar: The English Syntacticon*. New York: Mouton de Gruyter.
- Eysenck, Michael W., & Keane, Mark T. (2010). *Cognitive Psychology : A Student's Handbook* (6th ed.). New York: Psychology Press.
- Janda, Richard D. (2000). Beyond "Pathways" and "Unidirectionality": On The Discontinuity of Language Transmission and the Counterability of Grammaticalization. *Language sciences*, 23(2), 265-340.
- Spivey-Knowlton, Michael, & Sedivy, Julie C. (1995). Resolving attachment ambiguities with multiple constraints. *Cognition*, 55(3), 227-267.
- Tutunjian, Damon, & Boland, Julie E. (2008). Do We Need A Distinction Between Arguments and Adjuncts? Evidence from Psycholinguistic Studies of Comprehension. *Language and Linguistics Compass*, 2(4), 631-646.
- Warren, Paul. (2013). *Introducing Psycholinguistics*. New York: Cambridge University Press.