Logical Phenomena In Causality

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1. Introductory Note

This paper deals with causativity (or as called in logic "causality") . This phenomenon has been widely discussed by logicians and philosophers in a way different from that of linguistics .

In this paper the following issues will be examined :

1. The close relation between semantics (which is an important aspect in linguistics) and truth values in logic and philosophy .
2. Factive verbs (which are those verbs that presuppose the truth of their complement like **know** and **realize**) and whether or not they are treated similarly in both linguistics and logic .
3. Whether or not some verbs which are considered causatives in linguistics are similarily treated in logic .
4. Whether or not the following issues in linguistics correspond to those in logic and philosophy (like , for example, **agent's role , duration , causing action , event** , etc.) though they have different names in each field , for example "**agents**" (in linguistics) are referred to in logic as "**causes**" .

The issues which will be discussed in this paper are those of direct relevance to this paper and correspond to linguistics .

Charlton's theory (1983) , Good's (1961 , 1980) and others' will be introduced briefly here , because they are , in a way , parallel to the linguistic analysis and are also related to other issues in linguistics which correspond to Von Wright's (1968 , 1971 & 1974) calculus , truth values , and the probability theory .

2. Logical Equivalence and Semantic Equivalence

Logical equivalence and semantic equivalence are names for the same concept .

In term of linguistics when sentences are synonymous it means that they are semantically equivalent to each other . In terms of logic and philosophy they are considered to be logically equivalent to each other , which means that if one of them is true the other must be true and vice versa . If two sentences are not semantically equivalent , it means that they are not synonymous and thus they are also logically not equivalent to each other , that is due to the close relation between semantics and truth values . Consider the following sentences :

1. Ali asked Helen to visit John .
2. Ali asked John to be visited by Helen .

In these two sentences there is neither semantic equivalence nor logical equivalence because in 1 Ali asked Helen and not John and in 2 he asked John and not Helen . In 1 it is true that Ali asked Helen to visit John , and in 2 it is not true that Ali asked Helen to visit John though it is true that Ali asked John to be visited by Helen .

The following sentences from Morgan (1973) have logical equivalence , and neither of them can be true without the other :

3a. John has never married .

b. John is a bachelor .

The difference is that 3a can occur with the context (because he cannot stand the ceremony) while 3b cannot occur with this construction unless it is amended as in 3e:

c. John has never married because he can't stand the ceremony .

d. *John is a bachelor because he cannot stand the ceremony .

e. John is a bachelor because he cannot stand a marriage ceremony .

f. John is a bachelor because he does not like marriage commitment .

3d above has been tested with 5 native speakers and was accepted by only one of them .

The unacceptability of 3d may be attributed to the fact that the nounphrase (henceforth NP) **the ceremony** needs a modifier and it also exhibits an anaphoric use of a definite article for which there is no logical operator in the sentence . An operator is a function which (from a specific syntactic position) modifies a set of properties . It can also be considered as a function which does not require an argument in contrast to a predicate which requires an argument (see Von Wright , 1963) . The negation of sentence 3d causes redundancy in the semantics when used with the NP the ceremony whose semantic information asserts contradiction in the construction . The NP ceremony is logically more acceptable with verbs rather than

with adjectival clauses . Sentence 3c is acceptable as the NP occurs in a verbal predicate and not adjectival clause . The lexical restrictions of the NP have some effect on the semantic structure of the sentence . Another reason may be attributed to the phrase itself where it does not justify the answer why ; especially when only the subordinate clause is negated because semantic equivalence is not logical equivalence . Consider the examples below which are synonymous :

4. The two children were each scratching the other's back .
5. The two children were scratching each other's back .

But the following examples have neither logical equivalence nor semantic equivalence because they are not synonymous .

6. The five kids were each scratching the others' backs .
7. The five kids were scratching the backs of each other .

The lack of logical equivalence and synonymy between sentences 6 and 7 is due to the position of the term **each other** which indicates uncertainty about the agent and recipient of the action . The syntactic position of each other in 7 imposes some restrictions on the sentence which does not make it clear whether or not each of the five kids has taken part in the action and received the action as well ; thus they are not synonymous

The semantic structure of the phrase **each ... the other** is different from that of **each other** and this difference has an effect on the semantic structure . One should not think that **each ... the other** is derived from **each other** or vice versa because each of them seems to have a different lexical entry .

In some cases the unacceptability of sentences like 8 and 9 below which are from Morgan (1973 , 26) , is attributed , in logic , to the logical imagination of the hearer:

8. * The orphan is living with his parents .
9. * They killed him but he did not die .

One cannot imagine any state of affairs in real life where these two sentences can be true . The logical contradiction shown by these sentences is responsible for the unacceptability in the logical structure as well as the semantic structure in linguistics . The logical structure here for a proposition P entails a structure of the form :

P (means either P exists) or

~ P (not , as ~ stands for negation)

This structure in logic represents truth values which are true or false . If two sentences are synonymous they must have the same truth value . In a causal situation , when the causal factor which (corresponds to the action in linguistics) influences the act chosen , it must influence the agent's beliefs and desires in such a way that an outcome is produced from that action which also exhibits the truth or falsity of the situation and that is how semantics and truth values are close and play a role in causativity . In logic , the agent's role seems to be an important element in a causative situation . This observation may emphasize the fact that causativity can be best represented through semantics and can be clearly expressed through semantics more than any other linguistic aspect , for more details (see Morgan , 1973) who adopts a point of view which supports mine here .

3. Logic and Factive Verbs in Relation to Causation

Factive verbs are those verbs that imply a true belief like know and realize . It seems logicians are also concerned with factive verbs and have related them to causativity considering factivity as a part of causativity on the basis that the agent's beliefs are influenced by the causal factor in such a way which shows the factive presupposition of the verb's complement and that's how factivity is part of causativity. In other words the causal factor may exhibit the truth or falsity of a presupposition which confirms or denies the vactivity of a verb in a particular construction . On such bases there is a relation between lingistics and logic concerning causativity .

Factivity , as a semantic phenomenon is one of the features of the verb **know** but at the same time it is also a consequence of the semantic notion of **know** . It can also be considered one of the selectional features of the verb **know** as it occurs only with true complements . The verbs **believe** and **thing** do not hold such characteristics .

If one compares the verbs **think** and **believe** with **know** , one may notice that the first two are unlike **know** as they do not presuppose the truth of their complement .

Yamanashi (1972 , 392) has claimed that the verb **teach** implies the idea of **<CAUSE TO KNOW>** , In linguistic situations one cannot overlook the semantic restrictions that a verb imposes on its sentence . However teaching someone does not assert that he/she knows what he/she has been taught as it has been suggested by Yamanashi **(1972)** . It is not always true that **Z** knows what **X** taught **Z** because if **Z** knows **Y** there is no need for **X** to teach **Z** . It is not always true that **Z** learns **Y** . If **Z** learns **Y** then one can say **Z** knows **Y** . The case could or could not be true that **X** taught **Z Y** but **Z** does not learn **Y** and in the second case it cannot be said that **Z** knows **Y** . One can claim here that know is derived from a construction like