

# Three Heuristics to the Linguistic Stimulus-Response Formula

Bo Liu<sup>+</sup> and Shuo Zhao

Department of Foreign Language and Literature, School of Humanities, Economics and Laws, Northwestern Polytechnical University, Xi'an, Shaanxi, China

**Abstract:** It is on the extensions of the linguistic “stimulus-response” formula proposed by Bloomfield, a famous behaviorist and structuralist in linguistics. Through the study on the “stimulus-response” process in communication under certain circumstances, the inadequacies of the original linguistic stimulus-response formula are pointed out: First, the recurrent structure of stimulus-response is not taken into account. Next, fewer participants are involved in the original study case. Additionally, such extreme cases as Dramatic Monologue and Soliloquy in literature are ignored in the original study case. In light of such inadequacies, three corresponding heuristics are expounded in this paper: ① Stimuli and responses at both ends of the stimulus-response chain are convertible to each other; ② The participants should be grouped according to their common interests, and then a quantitative analysis regarding the process of “stimulus-response” should be adopted; ③ In such extreme cases as Soliloquy and Dramatic Monologue, there are simple processes of “stimulus-response”. Meanwhile, new “stimulus-response” formulas corresponding to these heuristics are also proposed. These heuristics and new formulas can be taken as the extensions of the previous linguistic “stimulus-response” formula.

**Keywords:** Behaviourism, Structuralism, Stimulus-Response Formula, New Stimulus-Response Formulas

## 1. Introduction

Bloomfield, a famous behaviourist in linguistics, is the representative of American structuralism. Bloomfield’s *Language* was once regarded as the model of scientific methodology and the greatest work in Linguistics on both sides of the Atlantic Ocean in the twentieth century [1]. In the book *language*, he uses an interesting example to illustrate the stimulus-response phenomenon in verbal communication: “Suppose that Jack and Jill are walking down a lane. Jill is hungry. She sees an apple in a tree. She makes a noise with her larynx, tongue, and lips. Jack vaults the fence, climbs the tree, takes the apple, brings it to Jill, and places it in her hand. Jill eats the apple.” [2] Accordingly, he proposed the linguistic stimulus-response formula:

$$S \rightarrow r \dots \dots \dots s \rightarrow R$$

Fig.1: The Linguistic Stimulus-Response Formula

Here, **S** stands for the Practical stimulus to one of the participants, **r** the substitute reactions of one of the participants, **s** the substitute stimulus to the other participant, and **R** the external practical reaction of the other one [6].

When it comes to the linguistic stimulus-response formula, there are many doubts unsettled such as “Is the “Stimulus-Response” formula applicable to all cases?”, and “Is the example employed to illustrate the “Stimulus-Response” theory a typical one?” If the answer to those questions is negative, how will the proposed formula be revised or extended? In light of these questions, aimed to describe a more precise stimulus-response process in communication, this paper is devoted to reveal the inadequacies of the original formula and put forward corresponding heuristics and new linguistic stimulus-response formulas.

## 2. Research Background

Bloomfield’s linguistic stimulus-response theory is greatly influenced by Behaviourism. Behaviourism assumes that all things organisms do, including acting, thinking and feeling (any physical actions), can and should be regarded as behaviours [3]. Behaviourism maintains behaviours as such can be described scientifically without recourse either to internal physiological events or to hypothetical constructs such as the mind [4]. Behaviourist linguistics approaches language from behaviourism [5]. As for Bloomfield, linguistics

---

<sup>+</sup> Corresponding Author: Postgraduate Student for Master’s Degree. Tel: 13228012772;

Email Address: masterliubo@126.com.

is a branch of Psychology known as Behaviourism which holds that human beings can not know anything they have not experienced and that children learn language through a chain of stimulus-response reinforcement [1].

As stated earlier, Bloomfield employed an intriguing story to illustrate the stimulus-response process in communication. The story can be divided into three parts in temporal order: practical events preceding the act of speech, the act of speech, and practical events following the act of speech [2]. In the first part, the girl's hunger, the sight of apples and her relationship with the boy constitutes the speaker's stimulus. In the third part, the boy's reactions are called the hearer's response. It is noticed that it is the girl's speech act make her get an apple without picking it in person. Thereafter, Bloomfield put forward three principles[2]: 1 when one individual is stimulated , his speech can make another one response accordingly, 2 the division of labour and all human activities based on the division of labour are dependent on language,3 the distance between the speaker and hear, two separate nervous systems , is bridged up by sound waves.

Post-Bloomfieldian linguists such as Harris, Hockett, Trager, Smith, Hill, Hall, Lamb, to name a few, inherit the structuralism from Bloomfield, focus on empiricism, Tagmemics, Stratification theory, and so on[1]. According to relevant literatures in hand, they rarely furthered the stimulus-response formula. Current researches on the formula (theory) focus on its application in teaching [6] [7], psychological analysis [8], introduction to it, comments on it [9], and so on. Few of them are on its extension.

### 3. The First Heuristic

It can be observed that the formula is applicable to the analysis of communications or dialogues between two participants. That is, the example used to illustrate the linguistic "stimulus-response" theory is no more than a simple and ideal one, for daily communication among people is more intricate. The corresponding formula, therefore, is also a simple and ideal one. It can not account for complex situations.

The story proposed by Bloomfield does not end in the sense that we can add more stimuli and reactions into the story. It is possible that the story can continue like the following: "The girl is so moved by his action that she expresses her gratitude towards him. Hence, he is very glad and smiles. Then he climbs up the tree again and picks another apple in return for her gratitude..." It seems that the adapted story is more intricate than the original one. So is the relation between stimuli and responses in the new story. The boy's actions, for instance, become a new stimulus to the girl, which makes her moved and express her gratitude. Then her gratitude also becomes a new stimulus which stimulates him to pick another apple. A round of "stimulus-response" chain, thus, starts anew. Besides, it can be found that stimuli and responses at both ends of the chain are convertible to each other in the sense that the girl's actions become stimuli to the boy, and the boy's actions become stimuli to the girl in the adapted example. Hence, process of "stimulus-response" here takes place recurrently and is not a linear structure. The new story represents a different situation, and the original formula is supposed to be revised to fit in with different circumstances.

Theoretically speaking, one of the design features of language is Creativity. By Creativity, we mean language is resourceful for its Duality and Recursiveness, that is, language has the potential to create endless sentences. Speech acts is an indispensable part of daily communication. Hence, daily communication has the potential of Creativity. In addition, daily communication is also made up of many a stimulus and response. The Creativity of daily communication may exert more or less influence on its own components. In that sense, stimuli and responses may be creative or recurrent.

Accordingly, the First Heuristic can be summarized as the following: the process of "stimulus-response" is recurrent in actual communications between two participants, and those stimuli and responses at both ends of the stimulus-response chain are convertible to one another under particular circumstances. Under the guidance of the heuristic, the corresponding Linguistic formula can be described like this:

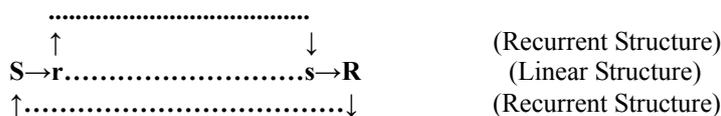


Fig.2: The Stimulus-Response Formula in the First Heuristic

Fig.2 shows is that **R** (the practical reaction) can be converted into **S** (the practical stimulus). As long as **R** is able to be converted into **S**, there will be numerous rounds of Stimulus-Response. What's more, the newly formed formula is with a recurrent structure, whereas the original formula is with a linear structure. Compared with the former formula, the latter is more applicable in revealing the process of stimulus-response in actual communication involving two participants.

From the stimulus-response perspective, questions proposed and answers offered in dialogues are equivalent to stimuli and responses respectively. When the dialogue proceeds, participants are receiving stimuli and making reactions. Thus, dialogues, one type of communication, can be regarded as a process of Stimulus-Response movement. It can be said that it is the stimuli and responses that push forward the communication. The dialogue is supposed to perpetuate in so far as the stimuli and responses are recurrent. In daily communication, stimuli and responses are more often than not aroused by topics. That is to say, as long as there are enough topics, the dialogue will continue.

#### 4. The Second Heuristic

It has been observed that the original linguistic formula is confined to the analysis of communications between two participants. Then, there comes a question on how to approach a situation where there are more than two participants as well as more stimuli and responses.

Actually, there are many topics (stimuli) which can arouse people's interests. Different people may adopt different responses to these stimuli. In order to narrow down the domain of analysis, merely the cases involving two groups of people, and a bipartite model will be studied.

When it comes to the analysis of the stimulus-response process in cases of more than two participants, we may divide them into two groups according to their interests. Suppose that people' attitude towards stimuli comprises three types: approval, disapproval, and neutral position. Then , according to permutation and combination in mathematics, in a group containing *m* people, they may adopt at most "3mn" responses to different topics(S(n)=n).That is, there are "r(x)" (3mn) responses in **Group1**. As stated earlier, any response may be converted into stimulus, hence, the "r(x)" responses can be regarded as "s(x)" stimuli by another group(**Group2**). By the same token, **Group2** may adopt at most "R(y)" responses to the stimuli from **Group1** (Suppose there are "y" participants in **Group2**, then  $R(y) = 3ysx = 9mny$ ). The linguistic formula in Heuristic1 could be extended like this:

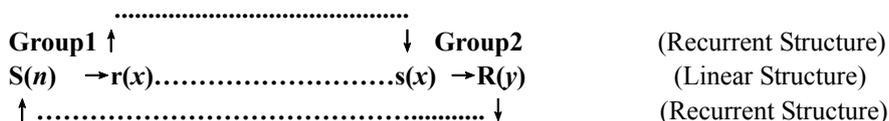


Fig.3: The Stimulus-Response Formula Involving Two Groups

If there are more than two groups of participants, different responses from groups may influence each group's reaction. Hence, the process of stimulus-response in such case becomes more complicated. The corresponding formula is:

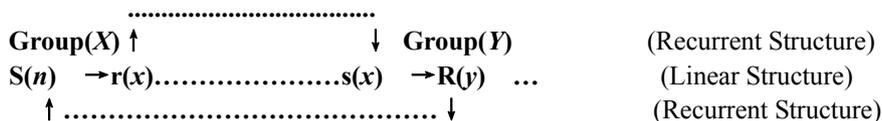


Fig.4: The Stimulus-Response Formula Involving More Than Two Groups (X≠x, Y≠y)

**Group(X)** and **Group(Y)** represent different groups respectively. And "... " stands for the possibility of participation of more groups. The process of stimulus-response within a single group, actually, is made up of simple stimuli and responses. Take **Group1**.The corresponding formula can be:

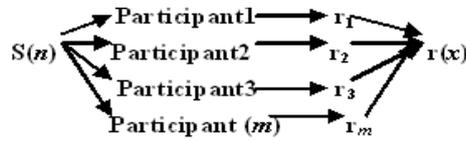


Fig.5: The Stimulus-Response Formula in Group One

This formula illustrates the fact that even within the same group, responses to various stimuli, even the same stimulus, may vary from people to people. In sum, the linguistic formulas in Heuristic2 can be concluded that when we study the stimulus-response process in complex communications involving many participants, for the sake of convenience, we can divide those participants into different groups according to their common interest shared. In the way, a qualitative method can be used to expose the mathematic relations among stimuli and responses.

## 5. The Third Heuristic

There are extreme cases in which communications (dialogues) involves two participants in literature: one is Soliloquy, and the other Monologue. In Soliloquy, one participant is oneself, and the other the inner world of oneself. In Monologue, though two participants are involved, only one participant speaks.

Soliloquy in drama means a literary device by which a character is alone and speaks his or her thoughts aloud [10]. The line “To be, or not to be, that is the question” begins the home-known soliloquy from Act3, Scene of Hamlet. In the soliloquy, Hamlet doubts weather or not life is worth living and speaks of the reason why he does not commit suicide. Via the soliloquy, Hamlet speaks out his inner feelings. In that sense, the soliloquy can be regarded as the dialogue between oneself (addresser) and one’s inner world (addressee). It is the distressing experiences that make him retrospect and lament over the past, that is, the exterior experiences stimulate him to talk a blue streak. As long as there are bitter experiences, he is supposed to lament over them. Moreover, various experiences will exert different influences on him. Hence, he will react (say something) accordingly. The formula in Soliloquy can be described as the following:

$$\begin{array}{l}
 \text{Participant(x)} \\
 \text{S(1)} \rightarrow \text{r(1)} \\
 \text{Participant(x)} \\
 \text{S(2)} \rightarrow \text{r(2)} \\
 \cdot \quad \cdot \\
 \cdot \quad \cdot \\
 \cdot \quad \cdot \\
 \text{Participant(x)} \\
 \text{S(n)} \rightarrow \text{r(n)}
 \end{array}$$

Fig.6: The Stimulus-Response Formula in Soliloquy ( $n \geq 1$ )

In the formula, **S(n)** stands for the outer world experiences and **R(n)** the corresponding responses. Up to now, no one has use similar diagram to analyze the relationship between Hamlet’s experiences (stimuli) and his words (responses). If the formula is employed to analyze Hamlet’s inner world, the intricacy of his emotion may be laid bare, for we have to take into consideration the relevant previous sections and the social circumstances in order to understand what he said.

Monologue, also called Dramatic Monologue in literature, refers to occurrence of a single speaker who says something to a silent audience [10]. Robert Browning’s *My Last Duchess* is a typical example in which the duke speaks to a non-responding audience. The monologue reveals not only the reasons for his disapproval of the behavior of his wife, but also exposes his mercilessness. In Dramatic Monologue, there are two participants. However, merely one participant plays the most important role in communication, and the other is silence or motionless. Whatever the addresser says, the audience does not make any response or produce any sound. The next section is to concentrate on these discussions: Is there any process of stimulus-response in the Dramatic Monologue? Is the original formula put forward by Bloomfield applicable to Monologue? It can be further observed that the addressee does react in the sense that his silence is his action. The process of stimulus-response, therefore, does exist in the Dramatic Monologue. Nonetheless, the original linguistic formula has to be revised like this:

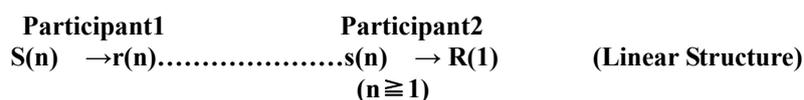


Fig.7: The Stimulus-Response Formula in Dramatic Monologue

In this formula, **S(n)** signifies various stimuli including outer and inner experiences and reality, **r(n)** symbolizes the correlative responses (speech or action). As stated earlier, any responses can be converted into stimuli under certain circumstances. Thus, **r(n)** becomes **s(n)** to **Participant2**. **R(1)** stands for the definite response of **Participant2**. No matter how many stimuli there are in communication, the audience's mere response is keeping silent. Through the formula, the process of stimulus-response is manifested clearly. Additionally, the formula can be used to help explain the definition of monologue, for pure didactic definition is abstract for some students.

Hereto, the third heuristic is that: there are special stimulus-response patterns in such communication cases as Soliloquy and Dramatic Monologue, which are subject to new stimulus-response formulas.

## 6. Conclusion

The three corresponding heuristics expounded are: stimuli and responses are convertible to each other; the participants should be grouped according to their common interests, and then a quantitative analysis regarding the process of "stimulus-response" should be adopted; and in such extreme cases as Soliloquy and Dramatic Monologue, there are simple processes of verbal "stimulus-response". Meanwhile, new "stimulus-response" formulas corresponding to heuristics are also put forward in this paper.

## 7. Acknowledgement

This research is part of the research project (No.Z2012184) supported by the "Graduate Starting Seed Fund" of Northwestern Polytechnical University (China).

## 8. References

- [1] Z.Hu. *Linguistics: A Course Book*. Beijing: Peking University Press, 2006, pp.320-321, 322-326.
- [2] L. Bloomfield. *Language*. Beijing: Foreign Language Teaching and Research Press, 2004, pp.22-27.
- [3] B.F. Skinner. *The Behavior of Organisms*. New York: Appleton Century Crofts, 1938, pp.472-473.
- [4] W.M. Baum. *Understanding Behaviorism: Science, Behavior, and Culture*. New York: HarperCollins College Publisher, 1994, pp.3-47.
- [5] D. W. Carroll. *Psychology of Language (Fifth Edition)*. Beijing: Foreign Language Teaching and Research Press, 2008, pp.11-12.
- [6] Y. Zhang. The situational structure of media aided learning: from behaviorism to cognitivism—a comparative study on media aided learning theory in distant learning. *Distance Education in China*. 2007, (10):17-22.
- [7] Y.G. The role of "stimulus-response" and "symbol-cognition" in foreign language teaching. *Journal of Harbin Vocational and Technical College*. 2011, (4):87-88.
- [8] Y. Wu & X. You. The effect of stimulus-response compatibility on meaning choice in Chinese ambiguous sentences. *Chinese Journal of Applied Linguistics*. 2005, (2): 160-165.
- [9] X. Wang. Introduction of Bloomfield's Language. *Legend Biography Literary Journal*. 2011, (2): 68-69.
- [10] Y.Gong & Q. Kong. *Postgraduate Examination Key Points for British and American Literature*. Shanghai: World Publishing Company, 2006, pp.3-3, 17-17.