THEORETICAL STUDY

Logical thinking in pattern differentiation of Traditional Chinese Medicine

Jing Zhou, Jiankun Zhu, Meijuan Chen, Miao Jiang, Zongming Zhang, Zhen Zhan, Xu Zhang

Abstract

OBJECTIVE: To discuss the application of logic to pattern differentiation for treatment in Traditional Chinese Medicine (TCM).

METHODS: Comparing logic reasoning of syllogism with the logical thinking of TCM pattern differentiation for treatment.

RESULTS: TCM logical thinking depends on symbolic and intuitive judgment with abstractive reasoning integrated into the process. Although it lacks quantitative measurement, it pays great attention to the comprehensive analysis of a disease's cause and its development patterns to get insight into the essence of illness.

CONCLUSION: TCM diagnosis reasoning method may lack rigorousness, continuity, systematic induction and deduction, but its logical thinking still can attain its goal following a process with rigorous, regulated and scientific formal logic.

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Key words: Logic; Traditional Chinese Medicine; Pattern differentiation; Syllogism

INTRODUCTION

The knowledge of medical science including Western Medicine and traditional medicines such as Traditional Chinese Medicine (TCM) and Tibetan medicine, is the accumulation of practical experience of human beings. Exploitation of state-of-the-art molecular biology, chemistry, physics, mathematics, statistics, logic etc, better facilitates the test of the efficacy of the medicines. And the knowledge of evidence-based medicine, grey system theory, mathematical model and logic have become the vital tool for the research into TCM. It is worth mentioning that logic topped the list of the disciplines in the UNESCO nomenclature for fields of science and technology. The history of logic can be divided into traditional logic phase and modern logic phase. The latter includes modern deduction logic and modern induction logic, which also is called the mathematical logical or symbolic logic. This article discusses TCM logical thinking for its pattern differentiation and the application of logic in TCM practice.
TCM LOGICAL THINKING AND ITS RELATION WITH FORMAL LOGIC

Characteristics of TCM logical thinking
TCM theory developed under specific circumstance, which made it to make use of black-box theory and systematic and holistic methods. Most of them belong to information system theory and cybernetics. Several characteristics of TCM logical thinking are as follows: 1) obtaining pathologic information without wound; 2) diagnosis based on information outside human body; 3) deduction of holistic conditions based on part of the conditions; 4) integration with abstractive thinking.

Four examinations of inspecting, listening and smelling, inquiring, pulse taking and palpating, are employed by TCM to collect pathologic information as evidences to judge the state of an illness without using sophisticated instruments and chemical examination. Pulse taking is not merely the pulsation of the arteries. It is closely related to the five Zang-organs and six Fu-organs, and the changes of Qi, blood, Yin and Yang. It provides the biologic information of human body and reveals motion information of human body’s matters and their changing patterns.

Relation between the basis of TCM logical thinking and formal logic
Formal logic is a abstract study of propositions and deductive reasoning. It strictly follows the logical rules such as law of identity, law of contradiction, and law of excluded middle etc. Its progression follows a straight-line or stair-way, which can be decomposed into the course of a series of continual analogy, induction and deduction. TCM logical thinking depends on symbolic and intuitive judgment with abstractive reasoning integrated into the process. It is a qualitative method used to grasp the pattern of an illness. Although it lacks quantitative measurement, it pays great attention to the comprehensive analysis of a disease’s cause and its development patterns to get insight into the essence of illness.

TCM logic thinking for diagnosis is a reasoning process that is based on clinical data available. The combination of intuitive reasoning and logical reasoning possesses some advantages despite the fact that it has some deficiency, which could lead to misdiagnosis and the ambiguity of illness information may lead to subjective judgment for diagnosis as well.

The human subconscious activities also follow certain logical rules, which is subconscious logic. The subconscious logic follows four basic laws, namely law of similarity, law of freedom, law of vagueness and law of coincidence. As to TCM, the so-called logical thinking of TCM is not completely equivalent to dialectical logic. Although TCM diagnosis reasoning method may lack rigorouinosness, continuity, systematic induction and deduction, TCM logical thinking still can attain its goal by following a process with rigorous, regulated and scientific formal logic.

INFLUENCE OF LOGIC CONCEPT ON TCM LOGICAL THINKING

Basic logical characteristics of concept
A concept has two basic logical characteristics: connotation and extension. Connotation refers to the characteristic or the essence of the object a concept defines; the extension refers to all things mentioned by the concept. According to its nature, the relations between concepts can be divided into compatibility relation and incompatibility relation. The former can further be subdivided into: identical relation, contained relation, containing relation and overlapping relation. The latter can be subdivided into: contradictory relation and opposed relation. From the perspective of the relation between extension, the relations between the subject term (hereinafter referred to as S) and the predicate term (hereinafter referred to as P) can be classified into five relations (Table 1).

Unified understanding of a concept from different angles of thinking
Professor Shine Zhu explained the possible pattern of unification of TCM and Western Medicine vividly with the expression of A+B+ab+C (Figure 1), which only explained respective contribution of A, B, C, ab to

<table>
<thead>
<tr>
<th>Judgment</th>
<th>Identical</th>
<th>Contained</th>
<th>Containing</th>
<th>Overlapping</th>
<th>Totally different</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP</td>
<td>Truth</td>
<td>Truth</td>
<td>Falsity</td>
<td>Falsity</td>
<td>Falsity</td>
</tr>
<tr>
<td>SEP</td>
<td>Falsity</td>
<td>Falsity</td>
<td>Falsity</td>
<td>Falsity</td>
<td>Falsity</td>
</tr>
<tr>
<td>SIP</td>
<td>Truth</td>
<td>Truth</td>
<td>Truth</td>
<td>Truth</td>
<td>Falsity</td>
</tr>
<tr>
<td>SOP</td>
<td>Falsity</td>
<td>Falsity</td>
<td>Truth</td>
<td>Truth</td>
<td>Truth</td>
</tr>
</tbody>
</table>

Notes: In this chart, O expressed accommodating relations between S and P; the gray expresses S. A means full title affirmation judgment (SAP: S always is P, shorted as A), B means full title denial judgment (S always is no P), I means stating affirmation judgment (S is P sometimes), O means stating denial judgment (S is no P sometimes).
the formation of a universal theory system, but did not mention their logical relations. For instance, A stands for the content derived from TCM theory, *Ying-Yang*, and meridian and collateral theory etc, which contribute to the new theory system; B stands for the content derived from Western Medicine theory; ab stands for the content of the overlap of TCM and Western Medicine; C stands for the contents derived from any other kinds of medicines except for TCM and Western Medicine.

Due to aristolochic acid and its metabolite--aristololactam. They are the basis for the plant’s toxicity to kidney. Obviously, two kinds of trifoliate akebia are different and imprecise definition creates a confusion, which causes the unexpected problem.

The essential element for thinking is concept. Therefore, no matter using the method of integrating TCM with Western Medicine or using TCM alone to diagnose and treat illnesses, the concept related to the process must definitely reveal the distinguished characteristics of the defined object to ensure that no deviation and divergence shall exist in the way of thinking.

**JUDGMENT IN PROPOSITION VS TCM LOGICAL THINKING**

*Categorical terms of proposition*

There are mainly four types. They are as follows:

- a) A-type--universal and affirmative symbolized with SAP;
- b) E-type--universal and negative symbolized with SEP;
- c) I-type--particular and affirmative symbolized with SIP;
- d) O-type--particular and negative, symbolized with SOP.

**Judgment of truth or fallacy in proposition and TCM logical thinking**

For SAP, take the syndrome for *Radix Bupleuri* as an example, if the symptoms of feeling fullness and discomfort in chest and hypochondrium, and alternating chill and fever accompanied by vomiting, or by being reluctant to speak and eat, or by reversal cold of limbs, then the syndrome *Radix Bupleuri* is true. And the judgment of a syndrome for *Radix Bupleuri* is fallacious if any of the accompanied symptoms appear while the symptoms of feeling fullness and discomfort in chest and hypochondrium, and alternating chill and fever do not always appear. Then in the latter sense, the syndrome is not the chief complain for the medicine using *Radix Bupleuri*. Therefore, in the process of TCM pattern differentiation for treatment, all type of propositions should be explicitly defined so as to ensure that it is able to be performed correctly.

**DEDUCTION OF SYLLOGISM AND TCM LOGICAL THINKING**

*General rules for syllogism and its basic structure*

1) General rules

A syllogism is a deduction that consists of three parts: two premises and a conclusion. The general rules for syllogism are summarized as follows:

- a. A valid syllogism must consist of three unambiguous terms.
- b. The middle term must be universal and unqualified in at least one premise.
- c. The middle term must be distributed in the two premises and the middle term may not show up in the proposition, which demands that the middle term must serve as the subject of one premise and the predi-
c) The middle term is required to be distributed in the two premises and the middle term may not appear in the proposition.
d) At least one premise must be affirmative.

2) A syllogism may be classified as one of the four figures

The differing positions of the major, minor, and middle terms gives rise to another classification of syllogisms known as the figure. Given that in each case the conclusion is S-P, there exist four figures (Table 2):

<table>
<thead>
<tr>
<th>Syllogism</th>
<th>Figure 1</th>
<th>Figure 2</th>
<th>Figure 3</th>
<th>Figure 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major premise</td>
<td>M-P</td>
<td>P-M</td>
<td>M-P</td>
<td>P-M</td>
</tr>
<tr>
<td>Minor premise</td>
<td>S-M</td>
<td>M-S</td>
<td>M-S</td>
<td>-</td>
</tr>
<tr>
<td>Conclusion</td>
<td>S-P</td>
<td>S-P</td>
<td>S-P</td>
<td>S-P</td>
</tr>
</tbody>
</table>

Notes: Figure 1, if M is P, then S is M, then S is P.

**Syllogism and TCM logical thinking**

In the process of TCM pattern differentiation for treatment, if two middle items appear with different meaning, there is no way to connect the major item and minor item, so no correct conclusions should be obtained. For instance:
a) TCM pattern differentiation for treatment has its history of more than 2000 years.
b) The Seattle Institute of Oriental Medicine in America uses the TCM pattern differentiation for treatment.
c) Therefore, the Seattle Institute of Oriental Medicine has a history of more than 2000 years.

The conclusion of this syllogism is obviously fallacious even though the two premises a and b are all true. Why? because it violates the rule mentioned above. Another instance in TCM, if John Dow catches cold, the symptoms can be seen are fearing chill, running fever and running nose together with thin-white-coating of tongue and floating-tight pulse. The diagnosis is external contraction of wind-cold. The syllogism in the instance can be stated as follows:
a) The symptoms of fearing chill, running fever and running nose, together with white-thin-coating of tongue, and floating-tight pulse can be diagnosed as external contraction of wind-cold.
b) John Dow was diagnosed as external contraction of wind-cold by having white-thin-coating of tongue and floating-tight pulse.
c) Therefore, John Dow should have the symptoms of fearing chill, running fever and running nose.

The conclusion is definitely fallacious because it violates the rules stipulated (the middle term must be universal, e.g. an "all," "every" or "no" statement in at least one premise).

**DISCUSSION**

Quite a few discussion over the integration of TCM with Western Medicine nowadays. However, logic thinking used in TCM pattern differentiation for diagnosis and treatment is not the problem of the integra-
tion of the two kinds of medicines. The diagnosis and treatment is a process of constant combination of empirical thinking and theoretical thinking, and is a process of constant evolution of thinking and decision-making as well. In sum, pattern differentiation for treatment is the primary method which typically epitomizes TCM characteristics and advantages in diagnosis and treatment of diseases. Only can its scientific value be achieved as long as the process of pattern differentiation for treatment is standardized. However, pattern differentiation for treatment tends to be more individualized, which contradicts to the need of standardized process. It is a hard problem to integrate TCM with contemporary medicine. Further study is required to address the problem.

**REFERENCES**