



## Letter to the Editor

### Acupoint selection based on pattern identification results or disease state



Birch and Alræk made interesting comments regarding our paper ‘Statistical inference of acupoint specificity: forward and reverse inference’.<sup>1</sup> We appreciate their interest in our study and their valuable comments. Their main concern was how doctors of Korean medicine (KM) prescribe acupuncture for patients, *i.e.*, based on either symptoms/disease or pattern identification.<sup>2</sup> They make an important observation: since acupuncture points can be selected based on both pattern identification and disease/symptoms, the results of this study can only be generalized to the latter. We agree that both approaches are valuable in the treatment selection process. Thus, our team has investigated both approaches, and this study represents one output of that investigation. Here, we will address this issue by presenting the results of studies that used the two different approaches for acupoint selection.

Different diseases can be treated using different acupoints, although individual acupoints have numerous indications.<sup>3</sup> It is difficult to characterize the complex association between diseases/symptoms and the specific acupoints targeted for treatment using direct one-to-one matching.<sup>4</sup> Pattern identification, a traditional approach to diagnostic classification, can provide an appropriate framework for making treatment decisions through extracting and synthesizing clinical data pertaining to patients’ signs and symptoms.<sup>5</sup> In Traditional East Asian Medicine (TEAM), pattern identification can play a pivotal role in identifying the relationship between symptoms/diseases and treatment selection. Therefore, in clinical practice, KM doctors usually employ pattern identification when synthesizing and analyzing clinical information pertaining to the choice of acupoints. Within the TEAM framework, KM doctors typically (1) make a diagnosis based on clinical observation of patients, (2) perform pattern identification, and (3) select the most appropriate treatment on that basis (Fig. 1A).

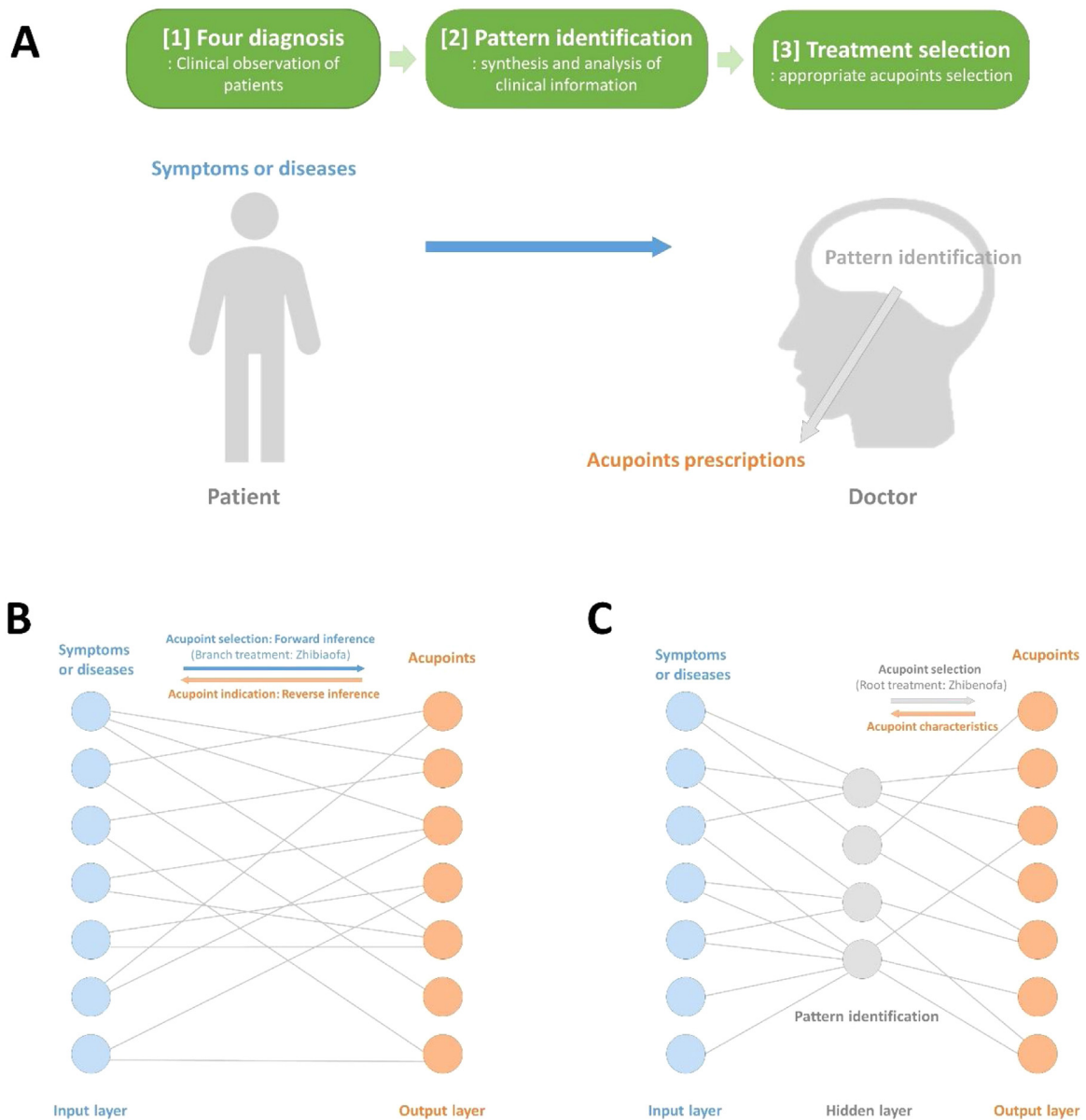
We conducted two separate analyses on datasets obtained from an online virtual diagnosis study, and presented the results in separate articles.<sup>1,6</sup> In the first study, we identified the association between pattern identification results and the prescribed acupoints.<sup>6</sup> For example, acupoints LR3, CV17, and GV20 were targeted in the treatment of a ‘Liver excess’ pattern, whereas acupoint BL40 was specifically associated with the ‘Bladder disease’ pattern (“acupoint characteristics”). In the second study, we identified an association between diseases/symptoms and the acupoints targeted for treatment.<sup>1</sup> For instance, the PC6 acupoint was targeted specifically for treating panic disorder, whereas for benign paroxysmal positional vertigo, acupoint GB20 is the target (“acupoint indication”). For clarity, we discussed the two main topics of acupoint characteristics and acupoint indication separately. How-

ever, to characterize the complex relationship between the disease condition and acupoints targeted for treatment, it is necessary to understand pattern identification as it pertains to matching common signs or symptoms to acupoints.

Some of our previous studies aimed to formulate TEAM-based diagnoses using a wide range of data, including classical medical texts, medical records, and virtual diagnosis data. In those studies, we used data-mining methods to reveal the associations between acupoint prescriptions and pattern identification results described in classical medical texts.<sup>7</sup> Recently, we used an artificial neural network to demonstrate that the relationship between symptoms and the acupoints targeted for treatment can be explored systematically using a knowledge discovery process, *i.e.*, pattern identification.<sup>4</sup> However, since the neural network could not label a hidden node, it was difficult to use it to identify the hidden rules that link symptoms to the acupoints targeted for treatment. However, we successfully determined the relationships between pattern identification results and acupoint prescriptions, in a study wherein KM doctors were asked to diagnose patients based on pattern identification and prescribe acupoints accordingly via an online virtual diagnosis method.<sup>6</sup>

In general, our studies were aimed at clarifying the diagnostic processes used in KM, which often involve an approach that can be described as “root and branch”. To clarify the two distinct approaches to acupoint selection, we propose using two different strategies for acupoint prescription in the context of TEAM, *i.e.*, “branch treatment” [*Zhibiaofa*] and “root treatment” [*Zhibenfa*].<sup>5</sup> Within the TEAM framework, KM doctors can select the most appropriate acupoints based either on the disease/symptoms (*i.e.*, branch treatment) or on the results of pattern identification (*i.e.*, root treatment).<sup>2</sup> Branch treatment decisions can be made according to the associations between the disease/symptoms and prescribed acupoints.<sup>1</sup> Our study showed that determining these associations enables selection of specific acupoints for a particular disease (*i.e.*, forward inference), as well as specificity with respect to acupoint indication (*i.e.*, reverse inference). Meanwhile, root treatment decisions can be made according to the associations between pattern identification results and prescribed acupoints.<sup>6</sup> Previously, we showed that such associations shed light on the specificity of acupoint selection for a particular disease (*i.e.*, forward inference), as well as the specificity of the acupoint characteristics (*i.e.*, reverse inference) (Fig. 1B).

In conclusion, it is important to understand the two different approaches to acupoint prescription. To clarify the indications for targeting individual acupoints, and their specific characteristics, it is necessary to understand the entire process underlying acupoint selection in clinical practice, including the fact that it is not based only on the disease or symptoms, but also on pattern identification results.



**Fig. 1. A. Flowchart of the overall process of acupoint selection in Traditional East Asian Medicine (TEAM).** Within the TEAM framework, practitioners typically make treatment decisions based on clinical observations of patients and pattern identification results.

**B. Schematic of the two different acupoint selection strategies.** *Branch treatment:* Understanding the relationship between disease/symptoms and acupoint prescriptions can enable specificity with respect to acupoint selection (*i.e.*, forward inference) and acupoint indication (*i.e.*, reverse inference) (left panel). *Root treatment:* The relationship between pattern identification results and acupoint prescriptions can shed light on the specificity of acupoint selection for a particular disease (*i.e.*, forward inference), as well as the specificity of acupoint characteristics (*i.e.*, reverse inference) (right panel).

#### Author contributions

YSL, YHR and YC conceived the ideas and wrote the manuscript.

#### Conflict of interest

The authors declare no conflict of interest.

#### Funding

This research was supported by the Korea Institute of Oriental Medicine (KSN1812181).

#### Ethical statement

No ethical approval was required for this manuscript as this study did not include human subjects or laboratory animals.

#### Data availability

Not applicable

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4 March 2020

Available online 16 March 2020