RESEARCH PROPOSAL FOR APPLYING FOR A JIEDE EMPIRICAL RESEARCH GRANT

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I. Title
Processing strategies in NSs and NNSs' reading of Chinese formulaic sequences: What can think-aloud protocols tell us?

II. Significance
Language is a hierarchical system consisting of linguistic units of different grain sizes. One type of units that has drawn significant attention from linguists is formulaic sequences (FSs), which are word clusters that are believed to be stored in and retrieved from memory as a whole when being used (Wray, 2005, 2008). Because it is found that a closed class of FSs covers a relatively large portion of language texts (e.g., Nattinger & DeCarrico, 1992), second language (L2) researchers believe that the learning of FSs can lead to the overall L2 proficiency (Wray, 2000; Granger, 1998).

However, although the consistent findings on native speakers' (NSs) processing of FSs suggest that FSs are retrieved from mental lexicons holistically, psycholinguistic studies with non-native speakers (NNSs) have not reached a consensus conclusion. Some findings suggest that NNSs retrieve the whole forms (e.g., Jiang & Nekrasova, 2007) and some suggest that NNSs may also analyze the internal elements (e.g., Siyanova & Schmitt, 2008) . One reason of this conflict may be acribed to the nature of NNSs' lexicons. Given the inherent variability of L2 knowledge and the limited total L2 exposure (Wray, 2002), the knowledge of FS possessed by NNSs may differ substantially from that possessed by the NSs. Another reason, as Ellis (1991) claimed, may be due to the research methodology, that is, the measures used to examine L1 processing may not be sufficient to examine L2 knowledge.

Therefore, the present study has a two-fold goal: (1) re-examine the issue of representation and processing of FSs by NNSs, and (2) validate the methodologies of studying L2 processing. This goal will be achieved through comparing a quantitative data, Reaction Time (RT), and a qualitative data, Think-Aloud (TA) verbalization, elicited in two repeated-measure Grammaticality Judgment Tasks (GJTs).

III. Background
RT data is used to reflect the cognitive effort (see Jiang, 2012 for a review). In this procedure, speakers responding latencies to a language stimulus are collected. How fast a speaker can respond to a stimulus reflects how much cognitive effort is spent during the moment. However, RT may not tell much about microscope questions, for example, how speakers handle the internal components.

TA is another procedure that has been widely used by SLA researchers to gather data about learners' thought processes (see Bowles, 2010 for a review). In this procedure, participants are asked to externalize their 'inner speech' and speak whatever is on their minds aloud when performing some task (e.g., reading comprehension, lexical decision task). Because TA collects speakers' self-reflection on a task or a stimulus, it is used by SLA researchers who want to provide both quantitative and qualitative

analysis of learning behavior in processing L2 stimuli. For example, Godfroid and Schmidtke (2013) used a combination of think-aloud, eye-tracking, and posttests to investigate incidental vocabulary learning. Ellis (1991) asked Chinese learners of English to think aloud when redoing a GJT which the participants did one week before and found learners were inconsistent in 22.5% in their judgments.

The proposed research also triangulates RT data collected in a silent GJT, and TA data elicited through the same participants' redoing the GJT two weeks later. I believe that the mixed method research will provide information about the CSL learners' FS knowledge that single measures may not be able to provide.

IV. Description of the study

Research questions:
- Do NNSs process FSs and novel phrases differently?
- What processing strategy, holistic or analytic, do NNSs of two different levels and NSs use to comprehend FSs versus the rule-generated novel phrases?
- Do NNSs judge the FSs and the novel phrases consistently in the two GJTs?
- Do speakers' verbal reports provide additional insight beyond the RT data?

Materials:
- Select FSs from the Contemporary Chinese Dictionary.
- Collect Chinese teachers' ratings on learners' familiarity of the selected FSs.
- Determine the FSs based on teachers' ratings; design matched rule-generated phrases to form a pair of contrast with each FS; add filler items.
- Split items into Block A and Block B; enter the material into the GJT program designed by Paradigm 2.4.

Procedures:
About 45 second-year (Level 1) and 45 third-year (Level 2) Chinese degree learners and 45 Chinese college students are recruited from Beijing Language and Culture University. Level 1 students all obtained HSK 4, and Level 2, HSK 6. Each level is randomly split into two groups, taking two experimental sessions in a counterbalanced order. Figure 1(a) and (b) demonstrate the experimental procedures of the two groups.

In the silent GJT session, participants first see a fixation cross in the center of the screen for 1000 milliseconds and disappear. Then a sequence is exposed in the same position. Participants are asked to judge whether or not a sequence is grammatical Chinese, by pressing a corresponding key (A for "YES" and L for "NO").

In the think-aloud GJT session, students will re-do a GJT with the same items, and in the meantime, report whatever is on their mind that helps them make the grammaticality judgments. Their verbal reports will be recorded by Audacity software.

Figure 1. Experimental procedures
(a)   (b)
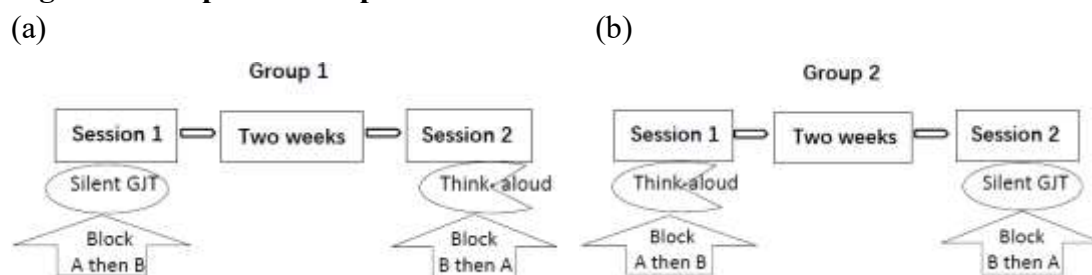
Statistical analysis:
- The interrater reliability will be indicated by Cronbach's alpha.
- The linear mixed models will be used to compare the quantitative data in the two GJTs and compare two levels (4 groups) of learners.
- Descriptive statistics of processing strategies will be presented.

V. Preliminary research and feasibility
The proposed methods have attained the approvals from the Office for the Protection of Research Subjects (IRB#17318) at the University of Illinois at Urbana-Champaign. I have conducted a pilot study in 2017, with18 Chinese learners and 18 native speakers to think aloud while they performed a lexical decision task. The preliminary analysis produced a coding system for the processing strategies. This step increases the interrater reliability of the following coding procedures. I have planned to conduct the second-round experiment in Beijing during the spring semester in 2018. The coming summer will be dedicated to data analysis. Should I be awarded the grant, I will be able to hire undergraduate and graduate students to assist me with the data management.

VI. Estimated budget (A total of $1,500)

Photocopying questionnaires and forms ($20)
Questionnaires (50 copies), background surveys (100 copies), IRB forms (150 copies).

Software purchases (Paradigm 2.4 license + SPSS 2.2 license = $200)

Services required for data management ($1,280)
1. Selecting test materials from the dictionary. I myself and 2 hired undergraduate students (75 hours x $5 per hour = $375).
2. Transcribing the recordings. I myself and a hired undergraduate student will transcribe about 40 hours' audio recordings (80 hours x $5 per hour = $400)
3. Coding the transcriptions. 2 hired doctoral students will code the verbalizations in order to check the interrater reliability (30 hours x $7.5 per hour = $225)
4. Data analyzing, I myself and a hired material student from a statistics program in Beijing (40 hours x $7.5 per hour = $280)

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