THE INFLUENCE OF COGNITIVE STYLE AND READING STRATEGIES ON ENGLISH READING
AN EMPIRICAL STUDY

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Abstract
This paper presents the results of a research study carried out with students of China University of Geosciences to analyze the influence of readers' cognitive styles (field dependent, field neutral, field independent) and reading strategies on their reading performance, including the total reading score, global inference questions, factual and detail questions, main idea questions, lexical inference questions. Results show the correlations between cognitive style and most of the reading questions are not statistically significant, except for the total reading scores and performance of global inference questions. One-way ANOVA shows that there is significant difference between the FN and FD group in total reading score and global inference questions. However, when the reading strategies have been partialled out of the correlations between cognitive style and reading scores, the remaining correlation with the total reading score and global inference and lexical inference reaches significance. This indicates the different information processing of FD learners and the important role of direct reading strategies for all learners. Teachers can help their students become more effective readers by encouraging them to apply direct reading strategies and apply different indirect reading strategies based on their different cognitive styles.

Key words
cognitive style, field independent, field dependent, reading strategies

1 Introduction
Field independence and field dependence have been among the most commonly used cognitive style dimensions. Chapelle 1992, Ehrman 2003, Jamieson 1992. Field independence (FI) addresses the degree to which an individual focuses on some aspect of experience and separates it from its background. Morgan 1997 describes that when the field is not clearly organized, individuals who tend to field independence are relatively likely to impose their own structure on the material whereas field dependent (FD) often accept it as it is.

Differing cognitive styles have been shown to influence achievement and attitude in learning tasks. Witkin, Goodenough 1981. The cognitive style field dependence/independence (FDI) is a measure of a learner's perceptual and processing characteristics which influence the preferences and strategies learners use to perceive, process, store, and recall information. Chinien, Boutin 1993, Niaz and Logie 1993, found field dependent learners less likely to use appropriate strategies for problem solving in science lessons.
When this concept is related to foreign language learning, a hypothesis can be proposed. Field learners do better on measure of formal language learning. Stansfield and Hansen [1983] found that field independent learners were better at classroom learning that involves analysis, attention to detail, and mastering of exercises/drills and other focused activities, as tested by discrete item instruments. Hansen and Stansfield [1981], Stansfield and Hansen [1983], and Hansen [1984] found relatively strong evidence in groups of adult second language learners of a relationship between field independence and cloze testing, which in some respects requires analytical abilities. Chapelle and Roberts [1986] found support for the correlation of a field-independent style with language success as measured both by traditional analytic paper-and-pencil tests and by an oral interview. Other studies, Alptekin & Atakan [1990], Chapelle & Abraham [1990], Chapelle & Green [1992], provide further evidence of superiority of a field independent style for second language success.

In China, empirical research on FI/FF and foreign language learning performance has achieved similar results. Wu and Liu [1993] found intermediate and advanced FI learners performed better than FF learners at the same level of language test. Xu [1999] found FI learners more likely to outperform FF learners in lexis/syntax/reading and writing learning. Wang [2001] found that FI learners spent more time on prewriting planning.

Also a number of studies, for example, Bialystok [1978] and Ellis [1999], have failed to find a significant relationship between GEF and Embedded Figures Test scores and measures of learning. Other studies comment on the weakness of the relationship.

But to my knowledge, no researcher has studied the relationship between FI/FN/FF and reading performance by subdividing reading ability and taking reading strategies into account.

2. Research Questions

Several questions arise from the review of the literature concerning reading comprehension and FI/FF. This study seeks to answer questions concerning the relationship between overall reading comprehension ability and specific reading ability and cognitive style field dependence/independence, and their relationship with reading strategies:

1. Is there a relationship between the cognitive style FI/FN/FF and reading comprehension?

2. Is there a relationship between the cognitive style FI/FN/FF and the performance of each reading comprehension question type?

3. Is there a relationship between the cognitive style FI/FN/FF and reading comprehension when the reading strategy factor is taken into account?

3. Method

3.1. Subjects

In May 2004, a random sample of 56 freshmen was drawn from two classes of China University of Geosciences: 29 male and 27 female, ranging in age from 18 to 20. A similar number of male students and female students was purposely chosen to ensure that the results are not influenced by the potential sex factor. They first responded to the GEFT. Administering the GEFT took approximately 11 minutes. Then they took the CET reading test and finally they finished a reading strategy questionnaire. 52 valid questionnaires were received, representing an overall response rate of 93%.

3.2. Instrument

Group Embedded Figures Test

The Group Embedded Figures Test (GEFT) was administered in order to assess each participant's level of field dependency. The GEFT requires one to locate simple geometric figures embedded in more complex designs within specified time limits. Figure 3. The estimate of reliability of the GEFT is 82% (Witkin et al., 1977). Participants who scored one half of a standard deviation above the mean on the GEFT were classified as field independent. Those who scored one half of a standard deviation below the mean were classified as field dependent. Individuals who scored within one half of a standard deviation of the mean were considered field neutral for this experiment.
The Influence of Cognitive Style and Reading Strategies on English Reading

CET Reading Test

Five passages of different style and registers were chosen and adopted from the CET test of the years 1991, 1993, 1995, and 1996. The validity and reliability of this test were verified following the division of the National College English Test Committee 1999. These 25 multiple-choice questions were divided into eight global inference questions, eight factual or detailed questions, six main idea questions, and three lexical inference questions. Main idea questions and factual questions were chosen to test the students' literal reading ability that is, the general understanding of the information directly and explicitly expressed in the text or obtained from the text and re-expressed. Questions of global inference and lexical inference were chosen to test students' reading ability at a deeper level. Inference judgment about the writer's attitude, guessing word meaning and determining references of demonstratives

Questionnaire

The reading strategy questionnaire is a self-assessment inventory including 19 statements on a five-point scale ranging from "strongly disagree" to "strongly agree" for assessing the reading strategies used during the three stages of reading comprehension: pre-reading stage, during reading stage, and post-reading stage. The items are partly adopted from Reading Strategy Awareness Inventory adopted from Miholic 1994 Strategy Inventory for Language Learning (SIL) by Rebecca Oxford 1990 and On the Learning Strategy by Wen Qiufang. According to the strategy classification system put forward by Oxford 1990, this questionnaire assesses the direct reading strategy, mainly cognitive strategy and compensation strategy. Indirect strategies such as metacognitive strategies and social strategies are excluded.

3 Method of Analysis

A correlation of GEFT scores and the reading comprehension test was performed to test the first two research questions. Also, the mean reading comprehensive score of three groups of subjects are tested by the one-way ANOVA statistical analysis to see if there is a significant difference between the performances of different groups. Finally, the partial correlation statistical analysis is used to test if there is a significant correlation between GEFT scores and reading performance when the reading strategy as an important dependent variable is controlled. The data were processed by SPSS 11.0.

4 Results and Analysis

Table 1 presents the mean GEFT scores of the participants. The mean GEFT score was 62.29 with a standard deviation of 26.2. In this study, 16 participants were identified as field dependent, 17 were identified as field neutral, and 19 were identified as field independent.

Table 1. Means Table for GEFT Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16</td>
<td>12</td>
<td>52</td>
<td>36.375</td>
<td>5.528</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>53</td>
<td>77</td>
<td>5.588</td>
<td>7.74</td>
</tr>
<tr>
<td>3</td>
<td>19</td>
<td>78</td>
<td>105</td>
<td>7.737</td>
<td>10.77</td>
</tr>
<tr>
<td>Total</td>
<td>52</td>
<td>12</td>
<td>105</td>
<td>6.289</td>
<td>10.187</td>
</tr>
</tbody>
</table>

Group 1: the field dependent group
Group 2: the field neutral group
Group 3: the field independent group

Table 2. Correlation Coefficients

<table>
<thead>
<tr>
<th>Total Reading Scores</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEFT score</td>
<td>443</td>
<td>486</td>
<td>0.039</td>
<td>0.213</td>
</tr>
</tbody>
</table>

Correlation is significant at the 0.05 level (2-tailed).
Note Type I Global inference questions
Type II Factual or detail questions
Type III Main idea questions
Type IV Lexical inference questions

As shown in Table 2, correlation between total reading scores and GEFT score is statistically significant (r = 0.43; p = 0.05). Global inference questions and GEFT score is statistically significant (r = 0.486; p = 0.05). But other reading scores including the total reading scores, factual questions, main idea and lexical questions are not correlated with GEFT score. Also, the correlation analysis shows that the correlation between reading strategy and reading scores is statistically significant (r = 0.315; p = 0.05).

Table 3 shows the analysis result of one-way ANOVA. An analysis of the data (F = 2.09; p = 0.01) indicates that there is a significant mean difference between the three groups on the total reading score. There is a significant mean difference between the three groups on the global inference questions (F = 2.92; p = 0.01), but no significant difference is found on other question types.

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total reading scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>11,209</td>
<td>2</td>
<td>5,105</td>
<td>7.41</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>41,098</td>
<td>49</td>
<td>871</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>31,668</td>
<td>2</td>
<td>1,834</td>
<td>8.76</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>7,563</td>
<td>49</td>
<td>160</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1,133</td>
<td>2</td>
<td>607</td>
<td>0.53</td>
<td>0.357</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>9,143</td>
<td>49</td>
<td>963</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>1,726</td>
<td>2</td>
<td>363</td>
<td>4.48</td>
<td>0.245</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>7,967</td>
<td>49</td>
<td>163</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>6,233</td>
<td>2</td>
<td>312</td>
<td>0.115</td>
<td>0.022</td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>8,433</td>
<td>49</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Post Hoc Tests shows that total reading scores of the field neutral group are significantly higher than the field dependent group and that of the field independent group are significantly higher than the field dependent group, however there is no significant difference between the field independent and field neutral groups.
Table 4: Post Hoc Tests

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Mean Difference</th>
<th>Std Error</th>
<th>Sig p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total reading score</td>
<td>1</td>
<td>0 00</td>
<td>768</td>
<td>013</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0 00</td>
<td>715</td>
<td>0971</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>0 00</td>
<td>48</td>
<td>987</td>
</tr>
</tbody>
</table>

The mean differences is significant at the 05 level.

Table 5 shows the result of partial correlation coefficients between GEFT score and total reading score and the different reading questions. When reading strategy is controlled, three remaining correlation coefficients are statistically significant. Still, global inference question has the strongest correlation with GEFT score. Total reading score and lexical inference questions, which are not significantly correlated with GEFT when reading strategy is not considered, are now significantly related to GEFT score. The more field independent one is, the better the performance in reading, particularly for the global inference question.

Table 5: Partial Correlation Coefficient — Controlling for reading strategy

<table>
<thead>
<tr>
<th>Total Reading Scores</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEFT Scores</td>
<td>3833</td>
<td>4372</td>
<td>0175</td>
<td>1589</td>
</tr>
<tr>
<td>1</td>
<td>49</td>
<td>49</td>
<td>49</td>
<td>49</td>
</tr>
<tr>
<td>2</td>
<td>P 005</td>
<td>P 001</td>
<td>P 903</td>
<td>P 265</td>
</tr>
</tbody>
</table>

Coefficient D [P] [F] [D] [F] failed significance.

5) Discussion

Generally speaking, the correlations between GEFT score and total reading score and most reading questions are not statistically significant except for the result that performance of global inference question is significantly correlated with GEFT score. One-way ANOVA shows that there is significant mean difference on the total reading score and global inference question between the FI, FN and FD group. However, when the reading strategies have been partialled out of the correlations between GEFT score and reading scores, the remaining correlation with the total reading score and global inference and lexical inference reaches significance.

The results indicate that the more field independent the learner is, the better he performs in the reading test, especially for the inference test in which comprehension ability at a deeper level is measured. Reading strategies contribute a lot to the reading performance. Many researchers have confirmed the positive relationship between the frequent use of reading strategies and achievement in reading (such as Phakiti 2003). This research also confirms the reading strategy is positively correlated with reading performance. FD learners who use more reading strategies that promote their reading score may perform better than FI learners who use less reading strategies. Therefore, when reading strategy factor is partialled out, the correlation between GEFT score and total reading score and lexical inference score become significant and the relation between GEFT score and global inference question is stronger. It indicates that FI learners have less difficulty in restructuring new information and forging links with prior knowledge than FD learners. In other words, FI learners have an advantage over FD learners in reorganizing information to provide a context for prior knowledge.

This result is similar to Niaz and Logie 1993 finding. When a limited amount of information is presented for processing there is little difference between field dependent and field independent
individuals] When larger amounts of information are to be processed [however] field independents are more accurate and efficient in their performance.

Witkin and Goodenough[1981] postulate that owing to differences in disembedding and cognitive restructuring abilities field independents are more likely to provide organization for ambiguous information and to restructure new information. This would result in more efficient processing in working memory as well as better storage in long-term memory. Lange[1995] theorized that when formal features of a particular stimulus elicit reflexive attention mental resources are allocated to the sensory stage depleting the resources available for processing and storage. At high cognitive loads this would result in shallow and incomplete processing of the information with only the most salient and vivid features being encoded. Exacerbating a tendency of field dependent cognitive style this in turn would provide only a few and perhaps incorrect associations to prior knowledge and inhibit the storage-retrieval process.

Semantic network models imply that a key to learning new information is associating it to existing knowledge by a semantically related link. According to Norman[1976] the more complex the links between existing knowledge and new information the more likely that new information will be learned. Current notions on learning propose that meaningful learning is accomplished when new information is linked to existing knowledge or node structures. Caudhill[1990] Butler[1990] Mayer[1989]]

Schema research demonstrates how the mind acquires new knowledge from existing information. To comprehend a text a reader’s personal schemata must interact with that of a text. To schematize a reader must be able to relate new meanings to what they already know. The more links between new and previously acquired knowledge the greater the depth of processing.

Inference is actually a process “use of a combination of questions and world knowledge to brainstorm logical possibilities” Vandergrift[1997]. When students engage in reading they entertain different possibilities and look for information based on world knowledge and inference which will confirm one of many possibilities. But for the FD learners facing the multiple possibilities they are so puzzled that they can hardly identify the irrelevant possibilities from the relevant ones just as they do in the GEFT test. The inability to develop a solid mental representation of the text in memory precludes the suppression of irrelevant information resulting in rapid fading of recently comprehended information. Gernsbacher[1990] Their inferences are not generated at a deep level that is at discourse level within the context of a solid conceptual framework. Kintsch[1998] notes that the conceptual framework is both an “inference machine” for filling gaps in meaning and a perceptual filter for suppressing irrelevant information. Therefore if the conceptual framework is not well enough developed to suppress irrelevant information inferences will remain superficial and never attain the depth necessary for forming a robust coherent mental representation of the text. That is the reason why FI and FN learners tend to perform better than FD learners in global inference questions rather than the factual and detail question or the main idea question for the latter requires no information reconstruction at the deeper level.

6 Conclusion

Findings of this research indicate that cognitive style FI/FD does affect the foreign language learner’s inference performance in reading when reading strategies are partialled out. Whereas FI/FD does not affect the performance of factual detail question or main idea question no matter whether reading strategies are considered or not.

Researchers should replicate this study to verify these findings. The reading test in this research is a formal classroom test and more contexts are needed to test the relationship between cognitive style and language learning. As Peter Skehan[1998] remarks “this area is largely untested and seems ripe for investigation.” But more scientific measures of FP/FI should be adopted. Riding[1991] for example has developed a computerized assessment procedure for measuring learning style.

Teachers should train students to skillfully employ direct reading strategies such as skimming for gist scanning for details and guessing words from context because direct reading strategies play the same role
for all the students both FI and FD learners.

In foreign language learning it may be incorrect to assume that learners should be either field independent or field dependent. It is more likely that persons have general inclinations but certain contexts can exercise a sufficient degree of an appropriate style. The burden on the learners is to invoke the appropriate style. Teachers should thusly understand the preferred styles of each learner and treat them flexibly. The training should be different because indirect strategies such as metacognitive strategies and social strategies weigh differently for FD and FI learners. For example, FD learners must be trained to adopt more metacognitive strategies such as arranging and planning and evaluating one's own learning while FI learners should be persuaded that social strategies such as asking questions and cooperating with others are important for achieving their language learning objectives. In that case improved reading performance is expected to be achieved by both FD learners and FI learners.

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62

| 选择数字 | 1 = 这句话完全或几乎完全不符合我的情况 | 2 = 这句话通常不符合我的情况 | 3 = 这句话有时符合我的情况 | 4 = 这句话通常符合我的情况 | 5 = 这句话完全或几乎完全符合我的情况 |

例如：“1.当我阅读故事和小说时,我能有意识地通过搜寻事件归纳出主题。（ ）”