

Study on the Automatic Information Processing Strategy in L2 Reading

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Abstract: Reading is currently a prominent topic in L2 acquisition research, serving as an indicator of L2 learners' overall language proficiency. However, there are still many challenges in reading for L2 learners. For example, there still exist some linguistic and non-linguistic problems, such as insufficient language ability, lack of cultural background knowledge, low reading efficiency, and poor reading habits. Effectively improving the information processing skills of L2 learners in reading posts a major challenge for researchers. This paper explores the effective strategies for L2 learners to obtain the ability of automatic reading information processing through the scale survey. It is found in the study that: 1) L2 learners believe that they can reach the level of automatic reading processing through the automatic information processing strategy; 2) The automatic information processing strategy can be applied in L2 reading to effectively improve the level of L2 automatic processing. Various strategies, such as improving language proficiency, increasing cultural background knowledge, utilizing metacognitive strategies, and employing socio-emotional strategies, both linguistic and non-linguistic, have been identified to effectively improve the automatic information processing ability of L2 learners. This study has important theoretical and practical value for improving the reading ability of L2 learners.

Keywords: L2 Reading; The Automatic Information Processing Strategy; The Scale Survey.

1. Introduction

In the information era, reading is an important and unique activity of human society (Mo, 2012), which finds its way into people's lives. L2 reading is very important for both learning process and purpose (Yao, 2004). In reading process, L2 learners need to integrate and process information, to communicate with the author according to cultural background knowledge and their own experience. However, there are still many challenges in reading for L2 learners. For example, there exist linguistic and non-linguistic problems, such as insufficient language ability, lack of cultural background knowledge, low reading efficiency, and poor reading habits. They cannot take effective strategies to improve their reading ability. How to effectively improve the reading ability of L2 learners is a important issue (Ni, 2013) L2 learners need to understand text information quickly and accurately to the level of automatically processing reading information as much as possible. In this study, the automatic reading information processing strategy are researched through the scale survey with the purpose of effectively improving learners' L2 reading ability.

2. Literature Review

Reading is a cognitive process of obtaining information through a certain medium (Lv, 2011). Essentially, it is an active mental activity where readers engage in experiential, predictive, evaluative, and confirmatory thinking processes based on given information, existing knowledge, and experiences (Chen, 1999). Reading ability is also an important skill for foreign language learners to improve their language proficiency. Scholars at home and abroad have conducted research on reading information processing and the application of related reading strategies, exploring such topics as the controlled and / or automatic L2 reading information processing, the factors influencing reading ability, and

reading strategies.

2.1. Controlled and / or Automatic Information Processing

Schneider (1997) classified information processing into two forms: controlled processing and automatic processing, based on the Dual Process Theory in cognitive psychology. Controlled processing refers to the conscious and deliberate thinking activities that readers engage in during the process of reading. This process requires cognitive resources as working memory capacity and attention. On the other hand, automatic processing is an unconscious processing process triggered automatically by stimuli, and it is not limited by cognitive resources (Wang et al., 2022). Language learners need to consciously engage in reading training in order to progress from the level of controlled processing to the level of automatic processing in reading comprehension.

Automatic tasks do not require significant involvement of cognitive resources, and the process of performing automatic tasks is known as automatic processing. Automatic processing is often unconscious, uncontrollable, effortless, efficient, and fast. Learners can adopt certain reading strategies to achieve a level of automatic reading.

In general reading processes, controlled processing requires a significant number of attentional resources. It is consciously controlled by individuals, has limited capacity, and can be flexibly used in a changing environment (Jing et al., 2007: 97-99). The automatic processing of L2 information does not require a significant number of attentional resources to maintain local coherence in information processing. It is not under conscious control and is not subject to specific capacity limitations. This process does not require the assistance of specific strategies. L2 learners should adopt strategies to facilitate the controlled processing of L2 reading information during the learning process, thereby improving reading ability and achieving automatic processing of information.

2.2. Strategies for Automatic Information Processing

L2 reading ability is also a process of improving overall language proficiency (Ni, 2014). Reading ability to some extent reflects language proficiency, and reading strategies refer to cognitive behaviors that facilitate the process of reading comprehension in certain contexts (Graesser, 2007).

Reading ability can be effectively enhanced by adopting scientific and reasonable reading strategies (Hao, 2023). For example, during the reading process, applying one's own knowledge to interpret the content of the text in details helps in effectively grasping new knowledge information. Reading strategies play important roles in improving L2 learners' mastery of reading ability and increasing reading efficiency. They contribute to strengthening of language intuition and enhancing of overall reading comprehension through improvements of reading efficiency and comprehension skills. L2 learners can enhance their reading comprehension process by improving their language proficiency, selecting reading materials appropriately challenging and novel, analyzing the structure of the text, and adopting some other strategies.

The automatic information processing strategy refers to the strategies adopted by L2 learners to transform the controlled processing of information during the reading process into automatic processing, thus achieving more fluent reading experiences. The use of reading strategies exerts significant impacts on reading comprehension (Cohen, 2014). According to Shi (2007), selecting reading materials, expanding the range of reading, training L2 learners to read at different speeds, and carefully deducing the meanings of new words can effectively improve reading ability and achieve the automation of information processing.

Zhou (2022), based on the Strategic Self-Regulation Model (S2R), categorizes reading strategies into metacognitive, cognitive, affective, compensatory, and socio-cultural interaction strategies. It is believed that these strategies can significantly enhance information processing abilities. Furthermore, the choice of reading strategies varies among L2 learners at different proficiency levels (Zhou, 2017).

Ni & Ji (2023) conducted a study on the impact of the information chunking strategy on L2 reading proficiency through a reading span test. This study shows that information chunking helps L2 learners improve their reading comprehension abilities, performing better in L2 reading tasks, and facilitating the automation of reading information processing.

Hu (2022) conducted a study on Chinese reading strategies among Central Asian international students with the scale survey, interviews, and observations. It is proposed that affective strategies are important parts of learning strategies and belong to social-emotional strategies. The more positive factors students invest in a course emotionally, the easier it is for them to learn and the greater the assistance they receive, thus making it easier to achieve automatic processing of information during reading. Conversely, if there are more negative factors, it can hinder learning progress.

Li & Ni (2023) conducted interviews and surveys to explore the relationship between controlled and automatic processing. They found that L2 learners can gradually approach the level of automatic information processing through the use of information processing strategies.

Scholars both domestically and internationally have explored various factors related to the behaviors,

comprehension, patterns, and strategies of reading. However, there is limited research on the role of the strategy of automatic reading information processing in developing L2 reading proficiency. This study aims to investigate this strategy, focusing on exploring such strategies as improving vocabulary, enhancing grammar knowledge, selecting appropriate reading materials, and analyzing textual logic) and their characteristics. This study also examines the effects of these strategies on reading information processing to derive effective methods for L2 reading comprehension. By studying the automatic processing strategy of L2 reading information, this research aims to explore effective paths for developing L2 reading proficiency. Therefore, this study holds significant theoretical and practical implications for improving the reading abilities of L2 learners.

3. Research Design

3.1. Research Content and Participants

This study adopts the scale survey to explore the automatic information processing strategy of L2 reading. The participants of the survey include undergraduate and graduate students from selected universities in Shanghai and Qingdao. The study focuses on investigating the effectiveness of the strategy of automatic reading information processing.

3.2. Research Procedure

Before formally conducting the the scale survey, the author of this paper first invited an expert in the field of L2 acquisition to revise the content and language expression of the scale survey. After conducting a pilot test, the researcher then distributed the scale survey to the participants from University of Shanghai for Science and Technology and those from Qingdao University by using a random sampling method through Sojump. The aim was to obtain the predetermined sample. Subsequently, the author of this paper collected the scale survey data, and then calculated the mean, standard deviation, Z-test, and some other statistical values for each statement of the scale survey.

3.3. Research Methods and Implementation

The content of the scale survey involves the selection and evaluation of the concepts and strategies related to reading and automatic information processing (such as metacognitive strategies, cognitive strategies, paraphrasing strategies, improving language proficiency, and enhancing cultural background knowledge). The Likert scale with 9 levels was used in the scale survey, requiring participants to indicate their degree of agreement with relevant statements by selecting a number that represents their level of agreement. The numbers 1 to 9 correspond to "Strongly Disagree," "Disagree," "Basically Disagree," "Slightly Disagree," "Neutral," "Slightly Agree," "Basically Agree," "Agree," and "Strongly Agree" respectively. These nine adjacent options have equal intervals of agreement differences. After collecting the survey data, the researchers conducted statistical analysis and discussion, and then drew research conclusions.

3.4. Reliability and Validity Analysis

The reliability of the study is measured with Cronbach's alpha coefficient. The results indicates that the reliability coefficient of the scale survey in this study is 0.864, greater than 0.8. suggesting that the reliability of the study is high.

According to the “Cronbach’s Alpha based on Standardized Items”, there was no significant improvement in the reliability coefficient. Therefore, all the items should be retained, further validating the reliability of this study. Overall, the high reliability coefficient indicates that the data can be used for further research.

The Kaiser-Meyer-Olkin (KMO) test for sphericity is also studied. The table obtained later shows that the KMO value of this study is 0.857, greater than 0.6, and the p-value is less than 0.05, indicating that the data obtained in this study is highly suitable for conducting exploratory factor analysis to

examine the validity of the scale survey. The 22 items in the scale can be divided into two dimensions and show a good correspondence with the 22 items. Therefore, the research data demonstrates a good level of structural validity.

3.5. Data Statistics, Analysis, and Discussion

The design, distribution, and collection of the scale survey were conducted with Sojump. The survey lasted for 4 weeks, and a total of 215 students participated in the survey. Among them, 197 of the scale survey were valid. The survey results are shown in Table 1.

Table 1. Results of Agreement with Each Statement.

Categories	Statements	Mean	SD	R1 vs R2	Z-test
The Concepts of Reading and Automatic Information Processing	Reading is a process where readers construct meaning by integrating linguistic and non-linguistic knowledge.	6.878	1.678	0.58/0.03	6.166
	Reading ability is a comprehensive skill that encompasses language knowledge, cultural knowledge, cognitive abilities, and reading habits.	6.776	1.837	0.61/0.05	6.825
	Automatic processing of reading information is the ultimate goal and important criterion for L2 acquisition.	6.770	1.838	0.58/0.06	6.462
	Automatic processing of reading information is a skill that can be acquired through the application of strategies.	6.923	1.742	0.64/0.04	7.016
	Automatic processing of reading information is a state of fluent reading.	6.781	1.718	0.58/0.04	6.492
	Automatic reading processing allows readers to process textual information without using strategies consciously.	6.520	1.991	0.52/0.08	5.139
	Automatic reading processing is an unconscious reading behavior that comes after long-term practice.	6.953	1.786	0.54/0.05	5.613
Strategies for Automatic Information processing	Increasing the vocabulary of L2 reading to achieve automatic processing of L2 vocabulary can help improve automatic information processing.	6.667	1.782	0.56/0.05	6.100
	Improving proficiency in L2 grammar helps to enhance automatic information processing in L2 reading.	6.663	1.751	0.58/0.06	5.556
	Choosing appropriately challenging L2 reading materials is beneficial for improving automatic information processing.	6.480	1.866	0.55/0.07	5.867
	Adjusting reading approaches based on text type or difficulty level is beneficial for promoting improvement in L2 reading comprehension abilities.	6.291	2.177	0.51/0.13	4.600
	Consciously training learners’ reading attention is beneficial for improving the automatic processing abilities of L2 reading.	6.413	2.052	0.55/0.10	5.469
	Having a strong motivation for L2 reading is beneficial for improving the automatic information processing abilities.	6.526	2.194	0.59/0.10	6.021
	Increasing cultural background knowledge is beneficial for improving learners’ automatic information processing.	6.418	2.083	0.49/0.10	5.753
	Cultivating good habits is beneficial for improving the automatic information processing abilities.	6.653	1.890	0.55/0.07	5.618
	Regular practice of L2 reading can effectively improve the automatic information processing abilities.	6.372	2.271	0.54/0.14	4.858
	Using cognitive strategies during reading helps improve the automatic information processing abilities of L2 reading.	6.709	1.890	0.60/0.05	6.678
	Using metacognitive strategies during reading helps improve the automatic processing ability.	6.719	1.958	0.60/0.06	6.381
	Using social and emotional strategies is beneficial for improving the automatic information processing abilities.	6.847	1.861	0.63/0.06	7.027
	Improving reading proficiency of English as a L2 relies on the use of the automatic information processing strategy.	6.660	1.906	0.53/0.06	5.427
	The automatic information processing strategy contribute to the comprehensive improvement of L2 text reading ability.	6.781	1.813	0.57/0.05	6.018
	The level of L2 text reading ability is not dependent on the use of the automatic information processing strategy.	4.857	2.340	0.15/0.49	-4.107

Note: 1) A total of 197 valid participants; 2) “Mean” represents the mean value, “SD” is the standard deviation, “R1” is the proportion of participants selecting values 7-9 divided by the total number of participants, and “R2” is the proportion of participants selecting values 1-3 divided by the total number of participants. .

Table 1 shows that the mean scores for the agreement with statements related to reading and automatic information processing are between “slightly agree” (Value Point 6) and “basically agree” (Value Point 7). The mean score for the statement “The proficiency of L2 text reading is unrelated to the application of the automatic information processing strategy” is 4.857, ranging from “slightly disagree” (Value Point 4) to “neutral” (Value Point 5). The mean scores for other statements related to the automatic information processing strategy also range between “slightly agree” (Value Point 6) and “basically agree” (Value Point 7). The statement with the highest mean score is “Applying social and emotional strategies during reading facilitates automatic processing of information” (Mean Value Point 6.847).

Table 1 also shows that over or close to 60% of the respondents strongly agree, agree, or basically agree with the statements such as “Reading ability is a comprehensive skill that encompasses language knowledge, cultural knowledge, cognitive abilities, and reading habits” “Reading is a process where readers construct meaning by integrating linguistic and non-linguistic knowledge” “Automatic processing of reading information is the ultimate goal and important criterion for L2 acquisition” “Automatic processing of reading information is a state of fluent reading” “The automatic information processing strategy contribute to the overall improvement of L2 text reading abilities” as well as the statements related to “Improving proficiency of L2 grammar” “Having a strong motivation for L2 reading” “Using cognitive strategies during reading,” “Using metacognitive strategies during reading” and “Using social and emotional strategies during reading to enhance L2 automatic information processing abilities.”

Over or close to 50% of the respondents strongly agree, agree, or basically agree with statements such as “Automatic reading processing allows readers to process textual information without the need for reading strategies” “Automatic reading processing is an unconscious reading behavior that comes after long-term practice,” “Improvement in reading ability of English as L2 relies on the use of the automatic information processing strategy” “Increasing cultural background knowledge” “Expanding L2 vocabulary” “Consciously training learners’ reading attentional resources” “Cultivating good reading habits in the L2” and “Adjusting reading methods based on text type or difficulty level to facilitate improvement in L2 reading comprehension ability.”

49% of the respondents strongly disagree, disagree, or basically disagree with the statement “The proficiency of L2 text reading is unrelated to the application of the automatic information processing strategy.”

In addition, the researchers conducted a Z-test for the difference in proportions (R1 vs R2) between the two statements based on the agreement levels in the survey results (as shown in Table 1). The highest Z-value was found for the statement “Using social and emotional strategies during reading is beneficial for improving automatic information processing abilities in L2 reading”. Regarding the use of social and emotional strategies for automatic information processing abilities in L2 learners, the proportions of individuals selecting Value Points 7-9 and Value Points 1-3 were 0.63 and 0.06 respectively, among the total valid respondents. The Z-test value ($Z = 7.027$) exceeded the critical value ($Z_{0.05} = 1.645$). Therefore, it can be inferred that the proportion of individuals agreeing with this statement is significantly higher than those who disagree, indicating a

significant enhancement of the automatic information processing ability in reading through the use of social and emotional strategies.

Similarly, according to Table 1, the researchers found that the absolute values of the Z-test differences for the proportions of individuals selecting other statement Value Points 7-9 and Value Points 1-3 exceeded the critical value. Thus, it can be concluded that there are significant differences in the proportions of individuals agreeing and disagreeing with each of the statements. Specifically, the Z-test value for the statement “The level of L2 text reading ability is not dependent on the use of the automatic information processing strategy” was negative, indicating a significantly higher proportion of individuals disagreeing with this statement compared to those agreeing. On the other hand, the Z-test values for the other statements were positive, indicating a significantly higher proportion of individuals agreeing with those statements compared to those disagreeing.

In conclusion, this study conducts a the scale survey and finds that the application of the automatic information processing strategy in L2 reading can improve students’ reading abilities of automatic information processing and comprehension. This finding is consistent with the previous studies by Cohen (2014), Zhou (2017), and Li & Ni (2023). The use of the aforementioned automatic information processing strategy can significantly enhance the automatic information processing ability in L2 reading.

4. Conclusions

Based on the previous studies, the author of this paper conducted the scale survey to investigate the understanding of automatic information processing and related strategies among L2 learners during the reading process. The purpose was to explore strategies that can help L2 learners achieve automatic information processing more effectively. The findings of this study are as follows: 1) L2 learners recognize that they can achieve automatic information processing with automatic information processing strategies. 2) L2 learners can significantly improve their automatic information processing in reading by applying the aforementioned the automatic information processing strategy.

Therefore, it is concluded in this study that there is a significant correlation between the use of the automatic information processing strategy and the students’ reading abilities of automatic information processing. L2 learners can improve their reading abilities of automatic information processing by employing the automatic information processing strategy. This research thus has theoretical and practical significance in promoting the improvement of L2 learners’ automatic information processing abilities.

It is important to note that this study only analyzes the data collected through a scale survey and relied on the participants’ self-perceived understanding of their own automatic information processing strategy. It lacks further analysis through semi-structured interviews. Future research can incorporate semi-structured interview data with the data of the scale survey to enhance the depth and persuasiveness of the study.

Acknowledgment

This work was funded by the Social Sciences Annual Research Project of Shanghai “A Study on the Interactive

Processing Mechanism of English L2 Text Reading” (2021BYY008). Ni Jincheng is the corresponding author of this paper.

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