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Investigating Iranian EFL Students' Metacognitive Online Reading Strategies, Critical Thinking, and their Relationship: A Mixed-Methods Study

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Abstract

The digital information age requires skills and strategies that are crucial in comprehending online academic texts. Also, research has emphasized the crucial role of critical thinking (CT) in education. Thus, this explanatory sequential mixed-methods study aimed to (a) identify Iranian EFL students' metacognitive online reading strategies and CT skills, and (b) investigate the possible relationship between Iranian EFL students' metacognitive online reading strategies in academic texts with their CT skills. To these ends, 80 Iranian EFL university students, selected nonrandomly from Shahrekord University, took part in this study and responded to the Pookcharoen's (2009) Online Survey of Reading Strategies and Facione, Facione, Blohm, and Giancarlo's (2002) California Critical Thinking Skills Test. In the follow-up, to probe into metacognitive online reading strategy use, 10 Iranian EFL university students were selected to do think-aloud online reading tasks. The descriptive statistics indicated that the EFL university students greatly preferred to use problem-solving strategies more, followed by different global and support reading strategies respectively. Also, evaluation and inductive (sub)skills of CT were used mostly by university students. Moreover, the results of the think-aloud provided evidence in support of quantitative results, confirming various problem-solving, global, and support strategy use in online academic reading. Furthermore, Pearson correlations revealed a positive and significant relationship, though it was small, between metacognitive online reading strategy use and CT skills. Integrating the findings from the quantitative and qualitative components call for metacognitive strategy assistance and instruction and CT development to improve online reading comprehension.

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INTRODUCTION

In educational settings, reading is considered an important skill for gaining knowledge and information for academic achievement (Alfassi, 2004), and gaining an accurate understanding of this skill is so important (Zarei & Kavyari Roustai, 2019). Reading comprehension is a key concept to effective participation in today's dynamic society (Brown, 2017). Understanding the multi-layered character of text environments as well as the provisions of virtual reality, affected our views of what it means to effectively teach reading (Pearson, & Cervetti, 2017). Besides, recent circumstances, such as the use of digital tools in activities that create, find, communicate, and assess information within a networked context, require students to have digital literacy (Singh, 2018). A huge part of reading today occurs on the internet, and online reading characterizes digital literacy. In this way, as Parker, Lenhart, and Moore (2011) state, in academic settings, gaining information by online resources has made reading comprehension a more focal skill than ever. However, as many researchers (e.g., Cho & Krashen, 2019; Khatib & Jannati, 2015) have pointed out, reading comprehension might be a challenge for students in foreign/second language (L2) contexts due to a variety of complex factors or features which are involved in the process of reading. Multidimensional interaction between reader, activity, text, and context and developing a supportive classroom environment to enhance strategic reading are among the factors that can make reading comprehension a complex phenomenon (Aferbach, Pearson, & Paris, 2017; Brown, 2017). These factors can play a prominent role in reading comprehension. Furthermore, as Brevik (2019) states, for novice readers, advancing a thorough understanding of the text entails a continued emphasis on scaffolded strategy practices.

Some researchers (e.g., Tavakoli & Koosha, 2016; Akkakoson, 2013; Ikeda & Takeuchi, 2006) have pointed to strategy-based reading instruction as an effective method in teaching L2 reading. More recently, several researchers (e.g., Oxford, 2011, Oxford, 2017) have highlighted a

form of strategy assistance to enhance L2 reading. In such cases, L2 students get more familiar with the reading process, participate in the reading class actively, and gradually become autonomous readers. Moreover, as Cohen (2007) points out, effective use of L2 reading strategies, at least partially, relies on L2 readers' awareness of metacognitive reading strategies. Therefore, the role of metacognitive strategies has found significance concerning reading skills. Metacognitive strategies are higher-order skills that make use of the learner's knowledge and repertoire of cognitive processes to regulate learning by monitoring, planning, and evaluating (Cohen, 2007; Oxford, 1990; Taki, 2016). Metacognitive strategies are considered crucial in online reading, too, since online readers need to "generate questions, locate, evaluate, synthesize, and communicate information on the internet" (Coiro & Dobler, 2007, p. 217), and such readers should employ metacognitive strategies to steer their way their ways via an unbounded informational space (Taki, 2016).

Furthermore, to develop the reading comprehension skill in English, as Alafssi (2004) asserts, L2 students need to comprehend the meaning of a text, assess the message critically, remember the subject matter, and flexibly use the new knowledge. Critical thinking (CT) is a crucial factor in the process of learning, efficient information seeking, and cognitive development (Aghajani & Gholamrezapour, 2019). CT in L2 teaching is related to a higher level of reading comprehension and refers to the L2 learner's ability in questioning and evaluating what is read (Richards & Schmidt, 2002). One can use the CT skills to understand, interpret, and assess what he/she reads and formulate appropriate reactions or responses (Aghajani & Gholamrezapour, 2019). CT skills, such as inference, synthesis, analysis, and evaluation are, higher-order skills of thinking that involve reasonable thinking and the ability to see problems, collect relevant information/data, interpret evidence, evaluate information, and guess viewpoints and personal perception and insights that can lead to effective, logical, real behavior (Hill, 2002).

In relating CT to reading comprehension, Paul and Elder (2006)

emphasize L2 students' understanding of their reading purpose and the writer's purpose in the text, connecting with the text, analyzing the reason of what is read, assessing and evaluating the logic of a text, developing questions, and finding answers to our questions while reading. L2 students, particularly university students, in today's world are facing an explosion of information, different beliefs, views, and values on the internet. Thus, it is important for university students, particularly those who study a foreign language, to equip themselves with CT skills and learn to utilize CT skills to their academic studies so effectively (Kealey, Holland & Watson, 2005). L2 readers who prefer not to evaluate a reading critically perhaps fail to connect the information to background knowledge, and achieve reading comprehension effectively (Schraw & Bruning, 1999). CT may help L2 students to shape their opinions by looking at the facts about an argument and sorting relevant information from the irrelevant (Sreena & Ilankumaran, 2018), particularly in online reading where they face an informational space and reading becomes an active and problem-based inquiry involving new skills and strategies (Taki, 2016). The thinking process guides L2 university students to master other skills and to read, write, and communicate effectively. Given the importance of CT, metacognition, and online reading, this study thus sought to investigate metacognitive reading strategies in online reading together with CT skills among a sample of English as a foreign language (EFL) university students and examine the possible relationship between the two in an EFL context of Iran.

LITERATURE REVIEW

As Oxford (2011) states, strategy concept dates back to ancient Greece, where the term *strategy* meant plans to win a war. Although its military aspect continues today, strategy means a strategic plan to achieve a goal. Today, strategies are formally defined as "conscious actions that learners take to achieve desired objectives" (Cohen, 1990, p. 15). The concept of strategies for learning began as a consequence of the cognitive shift taking

place in psychology when stimulus-response behaviorism was rejected in the 1950s–1960s and beyond (Oxford, 2011). Since then, different categorization and classification strategies have been introduced in the literature. Chamot and O'Malley (1990), for instance, divided strategies into three main categories of cognitive, social or affective, and metacognitive. Cognitive strategies include more direct use of the material, but social or affective strategies are closely connected to social-mediating activities and interacting with others. Metacognitive strategies draw in planning, thinking and evaluating, observing, and correcting in the process of learning. Also, Oxford (1990) classified the self-directed learner's strategies into affective, cognitive, metacognitive, social, and compensation strategies, and provided an assessment questionnaire (Strategy Inventory for Language Learning, SILL), which became the most widely used L2 learning strategy instrument. Later, Oxford (2011) gave another theory of L2 learning strategies, integrating information-processing and sociocultural concepts. Her model consisted of strategies and meta strategies for affective, cognitive, and sociocultural-interactive dimensions. According to Oxford's (2011, 2017) Strategic Self-Regulation (S2R) model, cognitive, affective, and sociocultural-interactive strategies are all directed by metastrategies i.e., meta-affective, metacognitive, and meta-sociocultural-interactive, which function as conductors in an orchestra. It seems that the role of metacognitive strategies, like monitoring, planning, and evaluating, for regulatory control over cognitive strategies continues to be highlighted in various classifications.

Requiring higher-order skills, reading is described as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (Snow, 2002, p. 11). Underpinning the above definition, different classifications of reading strategies have been introduced. However, as reviewed by Pookcharoen (2009), the classifications of different L2 reading strategies, in general, could be categorized as top-down or bottom-up. The first category is top-down strategies that the reader uses to predict text and content, set a goal for

his/her reading, and self-monitor the reading process. These strategies are referred to as general strategies or, what Sheorey and Mokhtari (2001) name, global strategies. The second category is bottom-up strategies that the reader uses to comprehend particular linguistic units. These are referred to as local strategies or, what Sheorey and Mokhtari (2001) name, problem-solving, and support strategies. Global strategies are what L2 readers purposefully plan for a general analysis of the text like activating background knowledge, examining whether the content material fits the purpose, and using context clues. Problem-solving strategies are the specific actions that L2 readers undertake, like adjusting reading speed, to solve problems once the text becomes difficult to understand. Support strategies involve using outside reference materials, like using a dictionary, to help comprehension. The above categorization can be applied to both cognitive and metacognitive reading strategies (Anderson, 2003), given that metacognitive knowledge may not be distinct from cognitive knowledge. The distinction lies in how the information is used (Grabe & Stoller, 2011).

Undoubtedly, the big revolution in technology has brought about a gradual shift from research in traditional reading to online reading in recent 20 years. According to literacy theory, as described by Leu, Kinzer, Coiro, & Cammack (2004), once new technologies are introduced, the nature of literacy and learning change. In this way, reading becomes a problem-based inquiry that includes new skills, tendency, and dispositions, requiring readers to utilize effective reading and metacognitive strategies to direct their course through an informational space (Taki, 2016). Taking this issue into account, some researchers have turned their attention to online reading strategies. For instance, Leu et al. (2007) recognized five strategies that readers use during online reading: (1) identifying key questions, (2) finding information, (3) assessing information, (4) synthesizing relevant information, and (5) communicating important information. The researchers concluded that traditional reading strategies were not enough for comprehending online information. Also, Anderson (2003) compared English as a second language (ESL) and EFL students' metacognitive online

reading strategy use at Brigham Young University. He concluded that EFL students employed more problem-solving strategies than ESL students.

In another study, Coiro and Dobler (2007) selected 11 young students with the highest combination of reading report card grades, standardized reading scores, and internet reading experiences in three middle schools in the northeastern and central US. The 6-grade readers performed two different tasks which included reading within multilayered websites and using the Yahooligans search engine. They found that readers employed three important types of online strategies: inferential reasoning, prior knowledge sources, and self-regulated reading processes. Along the same line, Pookcharoen (2009) investigated metacognitive online reading strategies among 111 less proficient and more proficient Thai EFL students. Different sources of data collection, including self-reports of online reading strategies and Internet questionnaires, were used. The findings showed that the methods of using metacognitive strategies differed among the less proficient and more proficient Thai students. The less proficient readers struggled much with huge vocabulary resulting in a careless understanding of the online academic texts.

In another context, Mesgar, Abu Bakar, and Amir (2014) investigated metacognitive online reading strategies utilized by Iranian postgraduates in several universities in Malaysia. They reported that the age and field of study had a significant impact on the metacognitive reading strategy use. Also, comparing Canadian and Iranian students, Taki (2016) examined the metacognitive strategies employed by the two groups in online reading. Thirty-eight Iranian university students as both Farsi L1 and English L2 readers and 52 Canadian college students as English L1 readers took part in his study. Both groups were invited to do three reading tasks on the Web as well as a survey of reading strategies. The results showed that the Canadian readers were high-strategy users and employed predominately a top-down approach, while the Iranian readers in both Persian and English were medium-strategy users. He concluded that Iranian readers had a preference for support and problem-solving strategies. The aforementioned

result lent support to the study by Alhaqbani and Riazi (2012), who found that undergraduate L2 Arabic readers viewed problem-solving strategies to be more useful than support and global strategies.

The related literature supports the enhancement of CT in educational settings. The basic insight into the concept of CT is traced back to Socrates, who developed an approach emphasizing the significance of asking questions and seeking evidence to analyze rhetoric (Paul, Elder, & Bartell, 1997). Also, research (e.g., Barjesteh & Vaseghi, 2012; Facione, 2006; Fahim & Bolghari, 2014; Shirazi & Heidari, 2019) has emphasized the value of CT in academic and professional settings. In the EFL context of Iran, several researchers investigated CT and its effect on writing and speaking skills (e.g., Kaviani & Mashhadi Heidar, 2020; Khabiri & Firooz, 2012) or its relation with other constructs, such as creativity (Fahim & Zaker, 2014), learning styles (Fahim & Bolghari, 2014), and academic achievement (Shirazi & Heidari, 2019) and reported positive relationships. As to the reading skill, research has also supported a positive association between CT and reading comprehension. For instance, Fahim and Aghaalikhani (2014) in a survey study showed that there was a significant association between EFL university students' reading comprehension and their CT among a sample of EFL learners from Islamic Azad University, Buinzahra branch. Furthermore, Valeh (2011) in a survey study showed that there was a significant relation between CT and metacognitive strategy use among Science/Technology and Art/Humanities students at Tehran University.

Metacognition, being viewed as a component of CT and creative thinking, is the knowledge and regulation of our cognitive processes (Jia, Li, & Cao, 2019). So far, the relation of CT with some key factors in education has been investigated in L2 research. Nonetheless, the relationship between CT and metacognitive online reading strategies among EFL learners is unexplored in the context of Iran. As part of their education, many students, including EFL students, at the university need to both apply CT skills to their academic studies and deal with online reading. They need effective

strategies to scrutinize and interpret a broad range of contexts while reading academic texts online. Therefore, exploring metacognitive reading strategies in the online environment and examining the association of metacognitive strategy use with CT skills bears significance in the higher educational system in Iran where electronic texts have introduced new opportunities and challenges, but still, linguistic approaches to reading literary prevail.

PURPOSE OF THE STUDY

The present study was intended, firstly, to examine Iranian EFL students' profiles of metacognitive online reading strategies quantitatively and qualitatively by relying on the global, support, and problem-solving strategy categorization (Sheorey & Mokhtari, 2001). It was believed that the qualitative follow-up investigation of metacognitive online reading strategies would assist readers to take a better understanding of online reading strategy use and provide complementary information/interpretation. Secondly, this study explored EFL university students' CT skills and the relation of CT skills with the students' metacognitive online reading strategy use. In view of the above issues, the present study addressed the following research questions:

1. What type of metacognitive online reading strategies does Iranian EFL university perceive to use frequently when reading online academic English texts? Does the qualitative data support the quantitative data in the first phase?
2. What critical thinking skills are used most by EFL university students?
3. Is there a significant relationship between Iranian EFL students' metacognitive online reading strategies with their CT skills?

METHOD

Quantitative Phase

The quantitative phase sought to identify the Iranian EFL students' profiles of metacognitive online reading strategies as well as their CT skills. Furthermore, this phase aimed to examine the association between metacognitive online reading strategies with CT skills.

Participants

Eighty (60 females and 20 males) EFL students, who were selected non-randomly from Shahrekord University in Iran, took part in the quantitative part of the study. They were selected through convenience sampling because they could be accessed by the present researchers. The participants included 65 undergraduate (43 senior and 22 junior) students, who were majoring in English Translation and 15 MA students, majoring in TEFL (Teaching of English as a foreign language), with the age ranging from 18 to 28. These participants were homogenous in terms of the scores (48-60) on the Oxford Quick Placement Test (OQPT, version 1, 2001). The participants were selected from a larger sample of 100 EFL students, based on their scores on the OQPT, which is a valid test to assess candidates' general English proficiency level. For the study, those students who were not able to achieve at least the score of 35 out of 40 on the first part of the OQPT were considered not to be proficient enough to for the data collection procedure to be included in the study. According to the guideline of the test (Syndicate, 2001), the first part of this placement test is taken by all test takers and is aimed at those students who are at or below intermediate level, while the second part is taken only by those candidates who have been able to achieve at least the score 35 out of 40 on the first part. All the selected participants had an acceptable command of English for the current study.

Instrumentation

This study made use of three instruments in this phase. OQPT, Online Survey of Reading Strategies (OSORS), and the California Critical Thinking Skills Questionnaire (CCTST). The OQPT, developed by Oxford University Press and Cambridge ESOL, consisted of 60 multiple-choice questions assessing vocabulary, grammar, and reading. It included two parts: Part 1 (questions 1-40) and Part 2 (questions 41-60). Part 2 is taken only by those participants who have been able to achieve at least the score 35 out of 40 on the first part. The test was used to select a homogenous sample of the EFL students who were not below the intermediate level of English and proficient enough for the study. The high index of the reliability of the test has been reported by several studies (e.g., Geranpayeh, 2003). The reliability index of the test, measured by Kuder-Richardson Formula 21 in the present study, was high (0.85).

The OSORS is an adapted form of the Online Survey of Reading Strategies by Anderson (2003), who designed the questionnaire using the Survey of Reading Strategies developed by Mokhtari and Sheorey (2002). As Taki (2016) states, the questionnaire concentrates on metacognitive strategy use within the context of academic reading by native and nonnative speakers of English. The OSORS was used to identify metacognitive reading strategies the readers perceived to use when reading a text online. The modified version of OSORS, piloted, and validated by Pookcharoen (2009), was used in the present study. Like the SORS, it included the same categories of reading strategies, but it consisted of 39 Likert scale items (which ranged from "*I never or almost never do this*" to "*I always or almost always do this*"). The score for each item would range from 1 to 5 (see Appendix). This version assessed three categories of online reading strategies: support reading strategies (10 items), global reading strategies (17 items), and problem-solving strategies (12 items). The survey, though not timed, took about 20 minutes to complete. The Cronbach's alpha for this questionnaire in the original study (Pookcharoen, 2009) was .92, and the

reliability indices for each subscale were satisfactory. In the present study, Cronbach's alpha indices of reliability were .89 for the OSORS and .80 (for global reading strategies), .72 (for problem-solving strategies), and .74 (for support strategies).

California Critical Thinking Skills Test (CCTST, Form B), was used to investigate the participants' CT skills. CCTST was originally developed by Peter Facione in 1990, but it was updated and published by Facione and his colleagues (Facione, Facione, Blohm, & Giancarlo, 2002). This scale had 34 multi-optional items with only one true answer, integrating five CT skills: evaluation (14 items), analysis (9 items), inference (11 items), inductive reasoning (16 items), and deductive reasoning (14 items). In this scale, some items measure more than one skill/subscale, so the total score is not the same as the sum of the subscale scores. The highest score for the whole measure is 34 and the scale should be finished within 45 minutes. In the present study, the valid and translated version of CCTST (Davoodi & Naghsh Poor, 2003) was used to achieve consistency and avoid cross-cultural differences. In the current study, the reliability of the test, calculated through the use of Kuder-Richardson Formula 21, was .71.

Qualitative Phase

As Creswell and Plano Clark (2011) state, researchers may employ qualitative follow-up investigations to help take a better understanding of the phenomenon where quantitative study per se does not produce enough information or interpretation. In this phase, 10 EFL students took part voluntarily in think-aloud sessions. They were selected based on their OSORS scores, including 5 participants with low scores (below the mean of the sample) on the OSORS and 5 participants with high scores (above the mean) on the OSORS.

Think-aloud was used to triangulate the quantitative results and identify which metacognitive online reading strategies the students unitize when undertaking online reading tasks. Through think-aloud, students can

report what is in their working memory (Pressley & Afflerbach, 1995). Also, concurrent reporting during the performance of a task in think-aloud suggests more information than reporting retrospectively (Kuusela & Paul, 2000).

Data Collection Procedure

A mixed-methods explanatory sequential design was adopted in the present study. The quantitative phase was conducted in Shahrekord University. First, the OQPT was administered to 100 EFL university students to select a homogenous sample of the EFL university students in terms of English proficiency level. Following the guidelines of the test, those EFL students who could not achieve the score 35 (out of 40) on the first part of the OQPT were excluded. Then, 80 EFL students whose scores were between 48 and 60 were selected as the participants of the present study. Then, they were invited to complete the OSORS, administered to them in a week. Also, those students who were willing to take part in the second phase were asked to give their contact information to ease communication between the researchers and the students. Following this, the CCTST was administered to the same 80 students to assess their CT skills. To increase the dependability of the data, the researchers elucidated the purpose of completing the questionnaire and assured the confidentiality of their feedback.

As Creswell and Plano Clark (2011) point out, for the qualitative phase in this type of design, it is better to select those individuals who take part in the quantitative data phase. Thus, two weeks later, 10 volunteer students who participated in the quantitative phase were invited for think-aloud sessions. They were informed about their rights (withdrawal, anonymity, etc.) during the study. To increase the dependability of the data, the think-aloud sessions were conducted in Persian whenever the participant preferred to use L1 when the data were recorded. Moreover, before conducting the think-aloud, a training session was held and they were asked to practice the method on an online text. Then, in the think-aloud, they were

asked to read two online texts (*Tips for Managing Stress* and *Assess Your Sleep Needs* with reading ease indices of 53.97 and 60.46, as measured by the Flesch reading east test) and verbalize the processes while reading online. Moreover, during the think-aloud, each student was provided with a typed sheet to refer to, with several comprehension questions about the texts. Also, these participants were allowed to search for any online resources to help their reading comprehension. All think-aloud data were recorded and were then transcribed. To increase the validity of the data, they were invited to verify the accuracy of the transcription and translation and elucidate any imprecision or possible errors. The transcription was later codified for the report by the two researchers. Moreover, the intercoder reliability, as measured by Cohen's Kappa, was also high (.94).

RESULTS

First Research Question

This study aimed to identify the type of metacognitive online reading strategies used most by the sample of EFL university students. To this end, the items of the OSORS were categorized into the subcategories of global, problem-solving, and support strategies and descriptive statistics of the OSORS scores were obtained (see Table 1)

Table 1: Descriptive statistics of the OSORS scores

Category	N of Items	Min.	Max.	M	SD
Global	17	2	4	3.25	.47
Problem-solving	12	1	5	3.57	.60
Support	10	2	4	3.03	.51
Overall	39	2	4	3.31	.40

The total mean of the strategy use ($M = 3.31$) was between 3 and 4 on a 5-point scale, indicating the moderate use of metacognitive online reading strategies. Moreover, problem-solving strategies were the most preferred type ($M = 3.57$), and support strategies were the least preferred one ($M =$

3.03). Following Oxford and Burry-Stock (1995), three levels of interpretation can be assumed: high usage group (with the mean of 3.50 or above), medium usage group (with the mean of 2.50 to 3.49), and low usage group (with the mean below 2.50). In the present study, the participants were considered as high users of problem-solving reading strategies and medium users of support and global reading strategies.

To gain more insight into the actual use of online reading strategies, the data from the students who sat for think-aloud sessions were used. The qualitative data from the think-aloud showed that the students employed problem-solving strategies more frequently. One of the problem-solving strategies raised by high score participants was *guessing the meaning of unknown terms*. One of the participants with a high score on the metacognitive strategy questionnaire reported (Pseudonyms are used in the transcriptions for ethical purposes):

> In the first paragraph of the text [*8 Tips for Managing Stress*], the word *nauseous* is new, um … but based on this sentence ["When you're stressed, … you may feel nauseous, dizzy"], I can guess its meaning. …It is a bad feeling, that is, sickening …. Here, in paragraph 3, I do not know the meaning of *crucial*, but because ...um... this word comes with *managing stress*, I guess, it means *important* …But here in paragraph 5, the word *cope with* is new. Well, eh… based on the sentence ["Some circumstances are simply beyond our control"], I guess, *cope with* means something like *manage*. (Meysam)

Also, another participant, with a high score on the OSORS, reported that she reread the paragraphs to understand them better. R*ereading* was one of the problem-solving strategies used by this participant.

Guessing the meaning of unknown terms by the use of context was frequently utilized by high score participants. This strategy was important to them, whereas *skipping difficult words/parts* was an important problem-solving strategy for the low score participants. For instance, a female participant who received a low mean score on OSORS kept skipping

difficult words in the reading of the *8 Tips for Managing Stress* text. She said:

> I don't know the meaning of *stressor*, *creep up*, and *soothing bubble bath* in paragraph 7. Well, I think, it's time-consuming … to check all these words in the dictionary… I skip this part right now and [will] be back, if necessary. This way I can read it faster and better. (Yasaman)

The participants, particularly those with a high score on the metacognitive survey, used other strategies such as *scrolling through the text, using tables, figures, and pictures, reading the questions before reading the text, employing sing typographical aids (e.g. bolding), clicking on internet links to other websites, scanning the text,* and *paying attention to the organization and length of the text*. Most of these were global strategies. The following excerpt demonstrates the use of a few of these global by one of the high score participants:

> Let's first scroll through the text, … but it's better to first read the questions before going over the text … now I am scrolling down the page, it helps me get the whole picture, um … and see the length and other features of the text, … it is very long. I am just scrolling the picture, title, bold-typed words [subheadings], before getting detailed information... and I am getting the main idea. It is about how our internal biological clockworks. (Parisa)

She seemed to be good at using global strategies. She began by reading the questions before going back to read the text (*8 Tips for Managing Stress*). She also emphasized the organization and the relationship between the paragraphs and ideas. Later, she used a link to other sites in case of not understanding some part of the text. Clicking on the internet links to other websites was another global strategy used by several other participants. For instance, one of them said, "Here, in the first paragraph, I am clicking on *stress reduction* to get more information about

it" (Linda).

Chatting or using instant messenger was another global strategy used by several high-score students. As an example, one of them reported:

> Well…I've never encountered *were up* in a sentence. Here, for this phrase in the sentence ["You were up for"], I'm going to discuss it with my fellows on the Internet … I think it's better to chat with my friends now and request them to help me … OK, let's chat. (Meysam)

However, while undertaking the think-aloud task, a participant, who was a negative case and had received a low score on the OSORS survey, *read the whole text* first before reading the follow-up questions in the text to come up with a general idea about the text. Moreover, some other students, who had obtained low scores on the survey, relied on the global strategy of *using prior knowledge.* One participant reported, "Comprehending this text shouldn't be so difficult since I have some information about the amount of sleep".

One noticeable support strategy used by the majority of the students was the *use of reference materials*, though the type of the reference materials was different. Several students used monolingual online dictionaries, several used synonym dictionaries, some preferred bilingual online dictionaries. For instance, a student with a high score on the survey made use of this strategy to find the meaning of *crises.*

> Because there isn't enough contextual clue here in the sentence ["Resolve issues before they become crises"], I can't figure out the meaning of *crises*, I would prefer to use the online dictionary on the internet, so I am checking the *Longman* dictionary. (Linda)

It is noteworthy to mention that the majority of the participants checked the dictionary after guessing the meaning through context because

they wanted to be on the safe ground. Following is an example illustrating how a student employed this particular strategy:

> Here, in paragraph 8, the word *deprivation* is unfamiliar to me, but based on the context around the word in the sentence, I guess it means *kind of not having enough of something*; however, I'd rather check the online dictionary to make sure of its meaning … Let's check (Sara)

Two other students, with low scores on the OSORS survey, used Google Translate to learn about the meaning of unfamiliar terms such as *deprivation* and *creep up*. They used translation from L2 (English) into (L1) Persian as a technique to have a better understanding of the text. In sum, the participants in the think-aloud actually used various metacognitive online reading strategies.

Second and Third Research Questions

This study sought to explore the CT profiles of the sample of 80 EFL students. To this end, descriptive statistics of the students' CT scores were obtained (see Table 2).

Table 2: Descriptive statistics of the CCTST and subscale scores

Subscale	N of Items	Min.	Max.	M	SD
Evaluation	14	1	8	4.68	1.77
Inference	11	1	8	3.18	1.61
Analysis	9	1	8	2.94	1.88
Deductive	14	1	9	4.40	2.04
Inductive	16	1	11	5.65	2.24
Total CT	34	3	21	11.36	3.76

As Table 2 displays, the inductive *(M = 5.65)* and evaluation *(M = 4.68)* subscales received the highest mean score. However, the analysis subscale received the lowest mean score *(M = 2.94)*. Moreover, the overall mean of

CT was relatively low ($M = 11.36$), that is, below the possible median score of 17 for the CCTST.

The last research question was intended to seek whether there was a significant association between the EFL students' total metacognitive online reading strategies and their CT. Pearson Product correlation was conducted to estimate the correlation coefficients between the scores from the five CCTST subscales with the score from the OSORS measure (see Table 3).

Table 3: Correlation coefficients of metacognitive online reading strategies with CT skills

Variables	Evaluation	Inference	Analysis	Deductive	Inductive	Total CT
Total OSORS	.01 (.910)	.11 (.310)	.14 (.190)	.23* (.004)	-.04 (.690)	.28* (.001)

The correlation coefficient between the CT and the total metacognitive online reading strategies was statistically significant and positive ($r = .28$, $p < .05$). The effect size was .08, which was, following Plonsky and Oswald's (2014) benchmarks, small i.e., below .25. The coefficients also indicated that there was a positive relationship between evaluation, inference, analysis, and deductive subscales with metacognitive online reading strategy use. Statistically, the relationship between deductive subscale and metacognitive online reading strategies was significant at $p < .05$, but it was low, with a small effect size (.05)

DISCUSSION

As to the metacognitive strategy use, the results have revealed that the Iranian EFL students generally employed various metacognitive strategies while reading online texts to manage, evaluate, and enhance their reading comprehension. Based on the quantitative results, the Iranian university students were moderate users of metacognitive online reading strategies.

This finding gains support from the results of Taki's (2016) study, which showed that the Iranian readers of Farsi L1 and English L2 in Canada used metacognitive reading strategies at a moderate level. It also indicates that the university students in the present study were metacognitively aware of reading strategies in online reading. However, they might not have had adequate instruction in metacognitive strategy use or a suitable opportunity to enhance the required strategies, perhaps due to the poor Internet infrastructure or service. According to Alfassi (2004), the integration of metacognitive awareness into classroom reading instruction helps students become more proficient readers and achieve significant gains in reading comprehension. Besides, today's language learners, as noted by Taki (2016), should learn to develop effective strategies in online environments. digital competence is more than mere technical knowledge, and higher-order cognitive skills should be integrated into the reading programs.

Another finding is that the EFL participants reported the frequent use of problem-solving strategies such as guessing word meanings, reading slowly, skipping difficult terms, and trying to stay focused on their reading. This is a little different from the results from the previous studies which investigated reading strategies in the offline environments (e.g., Alexander & Jetton, 2000; Pressley & Afflerbach, 1995; Sheorey & Mokhtari, 2001). They reported that non-native readers used support strategies in the offline context more than problem-solving strategies. One reason might be due to the offline/online environment. Within the framework of literacy theory, online reading is viewed more as a problem-based inquiry (Leu et al., 2004), and it involves a process in which the reader constructs the text in mind (Coiro & Dobler, 2007), requiring new skills and strategies. Thus, it is logical that EFL students employ more problem-solving strategies in online reading. This also finds support from the claim in previous studies (Coiro & Dobler, 2007; Leu et al., 2007), arguing that online reading comprehension is potentially more demanding and complicated than offline reading comprehension and there are some differences in readers' preferences and frequency of strategy use. Moreover, as Pookcharoen (2009) argues, online

readers need additional strategies besides the strategies used in the offline setting to deal with their online reading process. Likewise, the greater use of problem-solving strategies in the current study can lend support to the study of Alhaqbani and Riazi (2012) who found that undergraduate L2 Arabic readers perceived problem-solving strategies to be more helpful than support strategies.

Additionally, the qualitative data from think-aloud sessions revealed that some of the EFL students were not equipped well with metacognitive online reading strategies. As observed in the think-aloud tasks, some students encountered problems obtaining further information from the organization of online texts and using search engines. They did not google and find appropriate sites for understanding difficult parts in the online text. Those students who received low scores on the metacognitive reading survey (OSORS) used Google Translate, which could not assist them much to find the right answer. Perhaps, these Iranian readers did not evaluate the effectiveness of the utilized strategies or did not differentiate categories of strategies so as to utilize them effectively in online reading.

Also, *guessing the meaning of unknown terms from the immediate context*, *employing reference materials*, *skipping difficult sections*, *adjusting reading speed*, *using prior knowledge*, *scrolling through texts*, and *utilizing images* were the most frequent strategies used in think-aloud. Further qualitative analysis indicated that those participants who received higher scores on the OSORS in the quantitative phase generally used the metacognitive strategies, like *guessing the meaning of unknown terms* and *going back and forth in reading text,* which seemed to be more effective, whereas those participants who received lower scores on the OSORS typically used the strategies, such as *translating from English into Persian,* which seemed to be less effective. The low score students sometimes skipped some parts or words if they were very difficult to them and did not normally use the internet links when they came across the difficult words. They largely avoided going back and forth in reading text, which might be time-consuming for them in online reading.

Considering CT, the results showed a low mean score of CT for the EFL university students, in general. The low mean score might be because of a lack of CT training or a shortage of attention to CT skills in the educational system in Iran. According to Barjesteh and Vaseghi (2012), Iranian students are not well trained as critical thinkers, even in their first language educational system, and EFL teachers often disregard their students' opinions in the class, not giving them the considerable opportunity to express themselves and develop their CT skills. Though some attempt has been made, and even though there have been some recent advances in the instructional teaching methods in L2 teaching, there is no clear way how to develop the CT skills in classroom settings at university and apply them in the English language teaching (ELT) curriculum in Iran (Kaviani & Mashhadi Heidar, 2020). Nonetheless, the EFL participants in this study obtained a higher mean score in evaluation, inductive, and analysis subscales. According to Facione (1990), experts characterize certain cognitive skills including analysis, evaluation, and inference as central or core CT skills. More specifically, the participants obtained higher mean scores on two of these central skills (i.e., evaluation and analysis subscales). This issue means that the EFL students had a relatively better performance in identifying the actual inferential relationships among statements and opinions, in assessing their credibility through describing their perception, judgment, or views.

Furthermore, the above results revealed a positive relationship between several CT skills and metacognitive online reading strategy use, but the degree of relationship was low. Besides, the relationship between total CT and deductive subscale with metacognitive online reading strategy use was statistically significant. Though the degree of associations was low and effect sizes were not large, these relationships should not go unnoticed. The EFL students who possessed higher levels of CT and could arrive at specific conclusions from general statements or propositions tended to use more metacognitive online reading strategies. This finding is logical though care should be taken to avoid strong generalization about the relationship.

CT deals with the analysis of questions or problems to reach a justifiable conclusion or hypothesis, and online reading is a problem-based inquiry which is concerned with a process of self-guided text construction (Coiro & Dobler, 2007). Thus, the students who think critically, and have the ability to analyze factual statements in the online text, construct meanings while reading the text, organize their ideas, make comparisons, draw inferences and evaluate them while reading online, can make better use of problem-solving strategies (such as rereading the text to foster comprehension or predicting the meaning of unknown vocabulary) and global strategies (like activating background knowledge or setting a goal for reading the text). The above result corroborates the results of the study by Valeh (2011), which revealed a relation between CT and metacognition among Science/Technology and Art/Humanities university students. Also, the positive and significant relationship of CT with metacognitive online reading strategy use in the present study emphasizes the supporting role of CT in reading comprehension, and partially support the findings of the prior studies on the relationship between CT and reading skill. As Fahim and Aghaalikhani (2014) state, there is a connection between improvement in CT and improvement in reading comprehension. Both share some cognitive processes.

CONCLUSION AND IMPLICATIONS

The findings revealed that the EFL university students in the current study reported the use of metacognitive online reading strategies at a medium level. Also, the quantitative data from the self-report questionnaire revealed that the EFL readers had a preference for employing problem-solving strategies, followed by global strategy use in online reading. Moreover, support strategies were the least preferred strategies. Further follow-up qualitative analysis of data from think-aloud revealed that the students used various problem-solving (e.g., *rereading the text to improve comprehension* and *guessing the meaning of unknown terms*), global (e.g., *scrolling through*

the text and utilizing context clues) and support (e.g., *using a dictionary*, *chatting and discussing reading with others*) strategies in online reading. The students with higher scores on the OSORS used more effective metacognitive strategies whereas those who received lower scores used less effective ones such as *Google Translate and translating into Persian.*

Most of the EFL respondents were medium users of metacognitive strategies. By implication, a need is felt to increase Iranian EFL students' metacognitive awareness of reading strategies in the online reading environment and make them better online readers of English. The strategy assistance through interactions and strategy instruction in the classrooms are two ways that may raise metacognitive awareness of online reading strategies, bring mastery in metacognitive reading strategy use and facilitate EFL learners' understanding of online texts. As Anderson (2003) states, the absence of effective teaching strategies in online reading can be attributed to little research about the nature of online reading. the current study was a step towards encouraging strategy assistance and instruction regarding various metacognitive strategies for online reading.

Furthermore, the students' overall mean of CT and its subscale mean scores were relatively low. The results imply that some Iranian EFL students need to develop their CT skills such as analysis skills which may help them improve their metacognitive reading strategy use in an online environment. L2 policymakers, curriculum developers, and syllabus designers should pay attention to factors such as creativity (Fahim & Zaker, 2014; Jia et al., 2019) and teaching/learning styles (Fahim & Bolghari, 2014), contributing to the EFL students' thinking and analytic skills and prepare documents to integrate much more thinking skills into the body of instructional materials like their textbooks. In addition, the results revealed a small positive and significant relationship between CT and metacognitive strategy use in online reading. By implication, L2 teachers should provide and encourage environments in the school in which metacognition and CT skills such as problem-solving, analyzing, inferring, and evaluating are valued.

In closing, the findings should be interpreted in light of some limitations. Two self-report measures and think-aloud protocol were employed in the present study to gather data on metacognitive online reading strategy use and CT from a small sample of volunteers. However, because of the complexity of thoughts, processes, and actions, some reading strategies were difficult to observe. Thus, further research can employ other research tools such as interviews with a larger sample and other types of sampling to gain detailed information on the above variables. In addition, this study selected a homogenous sample and did not include those EFL students who were below/at the intermediate English proficiency level. Future researchers can take L2 readers' various proficiency levels and variables like gender into account regarding research about metacognitive online reading strategy use and CT.

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Appendix
Online Survey of Reading Strategies (OSORS)

Never or almost never	Only occasionally	Sometimes	Usually	Always or almost always
1	2	3	4	5

Strategies	1	2	3	4	5
1. I have a purpose in mind when I read online.					
2. I participate in live chat with other learners of English.					
3. I participate in live chat with native speakers					

of English.

4. I take notes while reading online to help me understand what I read.
5. I think about what I already know to help me understand what I read online.
6. I first scroll through the online text to see what it is about before reading it.
7. When online text becomes difficult, I read aloud to help me understand what I read.
8. I analyze whether the content of the online text fits my reading purpose.
9. I read slowly and carefully to make sure I understand what I am reading online.
10. I review the online text first by noting its characteristics like length and organization.
11. I try to get back on track when I lose concentration.
12. I print out a hard copy of the online text then underline or circle information to help me remember it.
13. I adjust my reading speed according to what I am reading online.
14. When reading online, I decide what to read closely and what to ignore.
15. I use reference materials (e.g., an online dictionary) to help me understand what I read online.
16. When online text becomes difficult, I pay closer attention to what I am reading.
17. When academic sites have links to other sites, I click on them to see what they are.
18. I use tables, figures, and pictures in the online text to increase my understanding.
19. I stop from time to time and think about what I am reading online.
20. I use context clues to help me better understand what I am reading online.
21. I paraphrase (restate ideas in my own words) to better understand what I read online.
22. I try to picture or visualize information to help remember what I read online.
23. I use typographical features like boldface and italics to identify key information.
24. I critically analyze and evaluate the

information presented in the online text.

25. I go back and forth in the online text to find relationships among ideas in it.
26. I check my understanding when I come across new information.
27. I try to guess what the content of the online text is about when I read.
28. When online text becomes difficult, I re-read it to increase my understanding.
29. I ask myself questions I like to have answered in the online text.
30. I check to see if my guesses about the online text are right or wrong.
31. When I read online, I guess the meaning of unknown words or phrases.
32. I scan the online text to get a basic idea of whether it will serve my purposes before choosing to read it.
33. I skip words or sections I find difficult or unfamiliar.
34. I critically evaluate the online text before choosing to use the information I read online.
35. I can distinguish between fact and opinion in online texts.
36. When reading online, I look for sites that cover both sides of an issue.
37. When reading online, I translate from English into my first language.
38. When reading online, I think about information in both English and first language.
39. When I encounter difficult reading in English, I seek material on the same topic in my first language.