Reading as a Single Construct: A Process-Oriented Study

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Abstract: The divisibility of the reading has led many researchers to examine whether reading construct is a unitary skill that cannot be divided into separate sub-skills, or it is composed of underlying components. In these studies, however, participants have generally been located in a product-oriented testing environment where their actual reading behaviors could only be observed or interpreted by the researcher through participants' reading time measures or think aloud protocols. Therefore, this study fills this gap by offering an opportunity to track moment-to-moment cognitive processes of reading construct through two eye-tracking technologies (i.e., Tobii Studio Eye Tracker T120 and Tobii Glasses Eye Tracking System) both on computer and paper tests, reducing the amount of errors brought by the researcher and environmental factors to investigate the nature of L2 reading. To this end, eight undergraduate students in English Language Teaching department at a major state university in Turkey responded to a reading comprehension test both on computer and paper. Results indicated that despite formal and explicit training on the use of expeditious sub-skills of reading for two semesters, participants did not employ these operations, rejecting a multi-divisible view of L2 reading construct. The results are discussed within the framework of language teaching and assessment.

Tek Yapı olarak Okuma: Bir Süreç-Yönelimli Çalışma
Öz: Birçok araştırmacı okumanın bölünebilirliğini araştırmış ve okuma yapısının ayrı alt becerilere bölünemeyen tek bir üniter beceriden veya bu yapının altında yatan birçok bileşenlerden oluşup olmadığını incelemiştir. Ancak, bu çalışmalarda katılımcılar genellikle ürün-odaklı ölçme uygulamalarına katılmış ve bu sebeple gerçek okuma davranışlarının araştırmacı tarafından ancak gözlenebilip, yorumlanabildiği okuma süresi ölçümleri ve sesli düşünme protokolleri aracılığıyla veri toplanmıştır. Bu çalışma ise, okuma yapısının anlık bilişsel işlemleri takip edebilen iki göz hareketlerini izleme teknolojisini (Tobii Stüdyo T120 ve Tobii Gözlük) hem kağıt hem de bilgisayar testlerini kullanarak araştırmayı amaçlamaktadır ve bu sebeple yabancı dilde okuma çalışmasında araştırmacı ve çevrenin getirdiği hata miktarını azaltmayı hedeflemektedir. Çalışmaya büyük bir devlet üniversitesinde İngilizce Öğretmenliği programında okuyan sekiz lisans öğrencisi katılmış ve katılımcılar hem kağıt hem de bilgisayar okuma anlama testini göz hareketleri takip edildiği esnada cevaplamışlardır. Sonuçlar, üniversitelerde iki dönem boyunca yoğun bir şekilde sunulan okuma becerilerinin hızlı ve etkin kullanımı derslerine rağmen, katılımcı işlemlerinin bu becerileri kullanmadığını ve bu sebeple yabancı dilde okuma yapısının tek boyutlu bir yapıdan oluştuğunu göstermektedir. Araştırma sonuçları dil öğretimi ve ölçümü çerçevesinde tartışılmıştır.

1. Introduction

Reading is defined as "the process of receiving and interpreting information encoded in language form" (Urquhart & Weir, 1998, p. 22). According to Omaggio (1979), reading comprehension is a complex process that involves factors such as linguistic knowledge and cognitive processing skills. According to Rayner, as we read effectively, there is an ongoing process of synchronizing quick and mechanical word recognition, syntactic parsing, meaning formation, inferencing, and linkages to prior knowledge reservoirs, all of which are processed effortlessly and simultaneously (1998). Likewise, as the participants respond to test items, they actively construct meaning by processing input and extract relevant information in accordance with the predetermined purposes.

Since reading is being described as "biologically an unnatural act" (Gough & Hillinger, 1980) and a mental behavior, it could be developed through close inspection and successful implementation of operations and processes that underlie reading. Therefore, particular training on enhancing reading comprehension skills is offered to language learners and test-takers that aim for better and faster reading processes and foster their understanding mainly at educational institutions. Further academic education is made available to learners studying at universities through reading courses such as 'Advanced Reading' and 'Academic Reading' where techniques and strategies in reading articles, books and other types of printed material are heavily discussed, and where there is particular concentration on developing each reading skill. Fundamentally, techniques for skillfully creating accurate meanings, comprehension and integration of information on these materials dominate these discussions together with opportunities for reading practices.

Regarding the types of reading, in their book, Urquhart and Weir (1998, p. 22) define six classes of reading for academic purposes. All these varied purposes of reading below set varying levels of demand for readers. However, the processes of scanning and skimming are within the scope of the current study.

1. Reading to search for specific information (i.e., scanning and skimming)
2. Reading for quick understanding (i.e., skimming)
3. Reading to learn
4. Reading to integrate information
5. Reading to evaluate, critique and use information
6. Reading for general comprehension (in many cases, reading for interest or reading to entertain)

Theoretically, scanning is defined as the quick process of locating specific information, for example, particular dates, names, and percentages. The reading rate is fast, and most of the information presented/discussed is ignored; therefore, readers are utilizing surface level of reading (Weir, Huizhong & Yan, 2002). Thus, operationalizations required for scanning involve rapid examination of the text to match specific words, phrases, and expressions.

In a similar fashion, skimming requires selective processing of information to grasp the main propositions made in the text, but it might incorporate careful reading as well as fast reading. The purpose of fast reading is to locate the general sense of the paragraph(s) and the text as the whole and only to read the relevant sections more attentively. Skills required for skimming involve reading titles, subtitles and abstracts, and the first and last sentences of each paragraph rapidly, comprehending the general purpose of the text through reading

introductory and concluding paragraphs carefully. When test-takers need to locate specific information and process text selectively in the text, they are faithfully engaged in an exploration process that implements scanning and skimming strategies in the accession of this particular data since these different purposes of reading necessitate the incorporation of expeditious and interactive processes.

1.1. Use of Eye Movements as a Measure of Cognitive Processing in Reading

The reliability of using one's eye movements to explain cognitive processes in one's reading has been heavily discussed in recent studies, and the findings have contributed enormously to the value of tracking eyes (Bertram, 2011; Buscher, Biedert, Heinesch, & Dengel, 2010). Essentially, Spivey, Richardson, and Dale view eye tracking as "a window into language and cognition" in their book (2009, p. 225). A more recent study has investigated the test-retest reliability of eye-tracking for the language processing and indicated eye-tracking is an *online* approach that shows intermediate states of processing that can reveal the mechanisms underlying performance (Farris-Trimble & McMurray, 2013). Therefore, it has been shown that eye-movement data could be reliably used to measure student-text interaction during reading.

Initially, when presented with a reading text, participants look at the scene, analyze and make eye movements which are called *saccades*. Between these saccades, their eyes stay still during these *fixations* for about 200-300 ms.; however, the duration of these fixations and saccade sizes are determined by the particular test at hand (Rayner, 1998). Table 1 shows that varying tasks cause differences in eye fixations:

Table 1
Mean Fixation Durations and Saccade Sizes in Different Reading Tasks

Task	Mean Fixations	Mean Saccade Size
Silent Reading	225 ms	8 letters
Reading Aloud	275 ms	6 letters
Visual Search	275 ms	3 letters
Music Reading	375 ms	1 letter

The presence of varied *fixation durations* over different reading tasks represents different ongoing cognitive processes. During silent reading, it takes less time to synthesize information, whereas reading aloud slows the reader down by 50 ms. Although eye movements are often directed from left to right, there are also backward movements of eyes which are called *eye regressions* so that a more detailed analysis of the part that causes lexical, semantic, or syntactic processing difficulty can take place. As these regressions enable the reader to closely examine the target word and sentence, regressions are likely to occur when the reader faces difficulties in reading, and skilled readers can successfully detect the areas that cause the processing to be troublesome (Frazier & Rayner, 1982; Kennedy, 1983; Kennedy & Murray, 1987a, 1987b; Murray & Kennedy, 1988), whereas less-skilled readers spend more time in more backtracking through the text (Murray & Kennedy, 1988) due to the fact that there are individual differences, and learners adopt various strategies in responding to a written text. Therefore, eye-tracking is also a powerful tool in identifying and explaining these differences efficiently. For instance, speed readers make shorter fixations, longer saccades, and fewer regressions than slow readers (Everatt, Bradshaw & Hibbard, 1998; Everatt & Underwood, 1994; Underwood, Hubbard & Wilkinson, 1990). Similarly, bilingual

readers have shorter fixations, longer saccades, and fewer regressions in their dominant language (Altarriba, Kroll, Sholl, & Rayner, 1996; Chincotta, Hyönä, & Underwood, 1997), and children who stutter make more fixations and regressions than nonstutterers (Brutten, Bakker, Janssen & VanderMeulen, 1984). Together, these studies have shown that differences in reading types and reader profiles influence the cognitive processes employed for reading, and that eye tracking is a measure that could successfully capture these task effects and individual differences.

1.2. Eye-tracking in L2 Reading Assessment

The nature of reading texts systematically directs test takers to adopt strategies that would essentially make them more successful readers. On the basis of question types, readers are encouraged to endorse certain reading behaviors. For example, the main idea questions require the test taker to expeditiously read the text and selectively extract information. Similarly, scanning strategies will to a large extent save readers' time if they could skillfully and rapidly spot the specific information (e.g., numbers, names of places and people). If there are any differences in those purposeful reading behaviors, an eye-tracking apparatus would primarily detect the use of these and establish whether readers constantly jump between the lines of the text and whether they strategically regress and jump forward in certain ways in their efforts to correctly respond to the test item.

Explicit training on these reading types would require the test taker to employ different modes of reading (e.g., reading for detail, scanning), and eye-tracking data or heat maps would illustrate the ongoing reading processes. Showing that a particular item was answered correctly through the use the appropriate operationalizations would imply the fact that the reader efficiently used relevant pre-determined skills to find the correct option. Therefore, inclusion of eye movements' analysis is the key to understanding and interpreting reading processes not only because they provide vital and significant information on the processing and test-taking behaviors of readers but also because active search is required in a reading text, and the meaning cannot singly be derived through techniques such as questionnaires and interviews.

It is also important to note that reading in English as a foreign language (L2) is quite different from reading in English as a native language (L1), particularly during tests. In L1 reading, it is generally at individuals' discretion as to what and how to read. In L2 reading, on the other hand, readers are generally put in a setting where they are given pre-selected texts and required to answer relevant questions under time constraints. Therefore, readers might tentatively be expected to use learned strategies to succeed in those tests. Studies in literature using the eye-tracking methodology are, however, limited to researching L1 reading and word-level and sentence-level inquiries and detecting ungrammaticalities. Therefore, due to the paucity of research, the current study aims to fill this gap by identifying the overall test-taking behaviors (i.e., scanning and skimming) of readers with English as their L2 who study at the English Language Teaching (ELT) department as they have actively responded to reading tests with the aim of providing data on the unidimensionality of the construct of reading.

1.3. Previous Studies

The present study uses an ecologically valid eye-tracking technology to investigate cognitive processes in reading and to provide insights into the nature of the reading in response to the call by Weir et al. (2002) who indicated the insufficiency of internal statistical measures and

need for the use of different methodologies to obtain data on the process as well as the product. This technology has long been in use; however, its use in gaining insights into L2 learners' reading strategies is quite new, as most of the earlier work focused more on lexical processing (Costa, Caramazza & Sebastián-Gallés, 2000; Lemhöfer & Dijkstra, 2004; Lemhöfer, Dijkstra & Michel, 2004; Schwartz, Kroll & Diaz, 2007; Van Hell & De Groot, 2008), processing ambiguities (Boland, 1993; Mestre & Pynte, 1997) and ungrammaticalities (Hawkins & Chan, 1997; Keating, 2009; Lenneberg, 1967; Sabourin, Stowe & de Haan, 2006; White, Valenzuela, Kozlowska-Macgregor & Leung, 2004). Due to the absence of studies, fewer of the results obtained in previous studies are directly applicable to the current study. Despite this being the case, studies conducted on reading processes will be discussed consecutively.

One of the first processing models was put forward by Just and Carpenter (1987), whose goal was to build a system that could replicate the actual reading processes, including scanning, skimming and encoding visual features. In their study, it was proposed that longer and rarer words are fixated on for a longer period of time than shorter and more frequent words. In a similar fashion, reading processes were studied by Just, Carpenter and Masson (1982) who examined the eye movements of expeditious readers (who read about 600-700 words per minute) and normal readers (who read approximately 250 words per minute). Normal readers were asked to skim the text, and they were tested through a reading test. Results revealed these two types of readers had similar scores on general comprehension questions including selecting main idea and gist of the text questions. Strikingly though, expeditious readers failed to answer detail questions while normal readers could answer them successfully.

Henderson and Ferreira (1990) and Rayner and Raney (1996) investigated the eye movements of learners as they read a passage and scanned the text in the task. Results illustrated the frequency of selected target words affected durations of word-viewing behaviors, and there was a robust word-frequency effect in the test while there was no difference between predictable and non-predictable words. A similar but more diagnostic study by Rayner and Fischer (1996) investigated eye movements of learners in a reading task. They were found to have higher skipping word rates and longer durations of first fixations on words in the task. The study also revealed that these readers skipped high-frequency words more than low-frequency words. In their research into the cognitive processes that students employ during an International English Language Testing System (IELTS) Reading Test, Khalifa and Weir (2009) categorized reading at the local or global levels. Also, they defined the nature of reading as careful or expeditious reading, which is fast, selective and efficient reading. They presented a model of cognitive processing in reading with regard to different ranks of complexity. Lexical processing, for instance, was characterized as the least complex processing. A more recent and descriptive study was carried out by Bax (2013). He investigated test-takers' cognitive processing as they completed onscreen IELTS reading test items whose particular focus on the test items and texts. He demonstrated significant differences between successful and unsuccessful test takers on a number of dimensions, including their ability to read expeditiously.

Together, these studies have helped examine the different cognitive processes governed by the nature of reading, but it is important to note that there is a paucity of research that implements process-oriented measures such as tracking the eyes. This study aims to fill this gap by utilizing two online measures to investigate the construct of reading, and whether it is a unitary or multi-divisible skill composed of sub-skills.

2. Methodology
This study is guided by the following research questions:
1. To what extent do L2 readers use scanning and skimming strategies as will be indicated by eye-tracking data?
2. Do L2 readers' scanning and skimming behaviors change in computer and paper reading tests?

2.1. Participants
There were eight volunteer undergraduate students with Turkish as their L1 who were studying in the English Language Teaching department at a major Turkish state university at the time of the study. Their ages ranged between 18 and 22 years and were in different grades. They all took the Advanced Reading and Writing course in their first grade whose syllabus included explicit instruction on scanning, skimming and other strategies for two semesters. If there were sub-skills underlying reading, it would necessarily be the case that these students had been informed of those and trained to use them effectively.

The participants (6 female, 2 male) were first given a questionnaire (see Appendix I) which aimed at identifying whether they felt secure and relaxed as they took the online tests. Participants who had never taken a test on computer in their reports were excluded from the study. All the participants were digital immigrants as described by Prensky (2001) and had access to computers at the university except for one participant who did not have any access to a computer at home. In addition, to control for the confounding effect of English language proficiency, participants' proficiency level was assessed through sample Reading, Listening and Speaking Tests of IELTS which is standardized, therefore, reliable assessment form used internationally for testing and research purposes. Before the administration of the test, all participants were given instruction on how to take the tests in a classroom by the researcher following the guidelines suggested on its official website ("Prepare for Your IELTS Test," 2016). Based on the number of correct answers, English language proficiency level was assessed, and participants were found to have a similar level of English proficiency (correct answer range 79-95). Further information about the participants is given in Table 2:

Table 2
Demographic Information of Participants Based on Their Answers to the Questionnaire

	Mean Values	*Standard Deviations*
Age	20.13	(1.24)
Years of Computer Use	10.37	(2.39)
Self-Rating in terms of Technology Use (on a scale of 1-5)	3.78	(0.70)
Comfort in Computer use (on a scale of 1-4)	2.75	(1.16)
Comfort in Computer Tests (on a scale of 1-4)	3.38	(0.74)
Comfort in Paper Tests (on a scale of 1-4)	3.38	(0.52)
The Choice of Test Medium	Paper: 0.88	(0.35)

	Computer: 0.13	(0.35)
Mean Proficiency Scores	86.9	(5.28)

2.2. Materials and Procedure

Two reading texts were used to explore the relative contribution of the posited and taught skills and techniques to reading comprehension. These passages were purposefully selected among all other available texts in the book entitled "Official Examination Papers from University of Cambridge 8" that allowed the researcher to empirically determine the link between theoretical assumptions of hypothetical reading types and their practical presence and uses. The texts were shortened by the researcher to avoid fatigue, and seven question items were generated by the researcher to specifically include scanning, skimming that would mirror the procedures to be examined, and therefore appropriate for the research's aim, as well as detail and vocabulary questions to avoid possibility that readers would employ specific strategies. The researcher ensured that the main characteristics of test items remained the same (see Table 3 for the main characteristics of each reading item selected for the study).

Table 3
Main Characteristics of Items

Question No	Main Characteristics	Type of the Text
1	Skimming	Computer
2	Scanning	Computer
3	Scanning	Computer
4	Scanning	Computer
5	Detail	Computer
6	Skimming	Computer
7	Vocabulary	Computer
1	Skimming	Paper
2	Scanning	Paper
3	Scanning	Paper
4	Scanning	Paper
5	Detail	Paper
6	Skimming	Paper
7	Vocabulary	Paper

Data collection procedure initiated after welcoming the participants into Human-Computer Interactions Laboratory using their native language (Turkish). Two texts with question items on the right side of each page were consecutively presented to all participants on both a computer monitor and on an A3-size-paper, and readers were told to complete each text in 25 minutes. Both of the texts had seven questions, five of which could successfully be answered by only scanning and skimming the text. The online text included 552 words, and the text on the paper contained 551 words after the questions were excluded. Their font type and size were the same: Courier New font type, 13 font size with double spacing was used. Also, all participants randomly took both the paper and the computer tests.

After getting the consent forms from the participants, their eye movements were recorded as participants read the text on the computer screen through Tobii Studio Eye Tracker T120

version 3.4.6 with a sampling rate of 120 Hz and on paper through Tobii Glasses Eye Tracking System with a sampling rate of 30 Hz. With Tobii Studio Eye Tracker participants sat at a distance of approximately 65 cm from the eye tracker. Before the experiment, a 9-point calibration was carried out in both of the experiments, and gaze of participants was calibrated and validated.

2.3. Data Analysis
In line with the research questions, the analysis was conducted in two phases: In the first phase, sections of the text in line with pre-determined test questions and relevant type of reading to be performed were specified. Information that needed to be attended in the text was carefully matched with these questions. The correct response to the questions together with the display of expected expeditious processes would mean that the reader successfully performed the predetermined operationalizations, which would indicate the divisibility of reading construct. Secondly, fixation durations and gaze plots regarding the computer and paper data were obtained for reading processes. Then, they were viewed and analyzed by the researcher as well as an audit by an expert in reading to ensure that results accurately described the readers' experiences. Through member-checking for gaze plots and careful sampling, this study underwent rigorous procedures to ensure the validity and reliability of the findings.

3. Results
A different color for each gaze plot was used to represent the cognitive processes that each participant utilized when they encountered the sources (see two sample gaze plot outputs in Figures 1 and 2 below). These plots revealed results for the first research question that investigated whether scanning and skimming strategies were employed by L2 readers. Findings clearly showed that test-takers did not engage in fast expeditious processes required for scanning or skimming skills but attempted to read every word in the text though all of the test items could be responded with reading efforts on focusing overall meaning except for two questions. Therefore, salient performance conditions previously described for scanning and skimming processes were not performed.

The plots also indicated that the linearity of the text was followed, and the majority of propositions in the text were carefully handled by reading without jumping between the lines. Also, only two participants evaluated the questions first, but they failed to realize reading selectively instead of reading each part of the text could provide the answers in completing the tasks. Though explicit instruction on the necessity to evaluate test items first was given to participants since the very beginning of their majors in university, one reader fully established macropropositional structure for the entire text prior to reading.

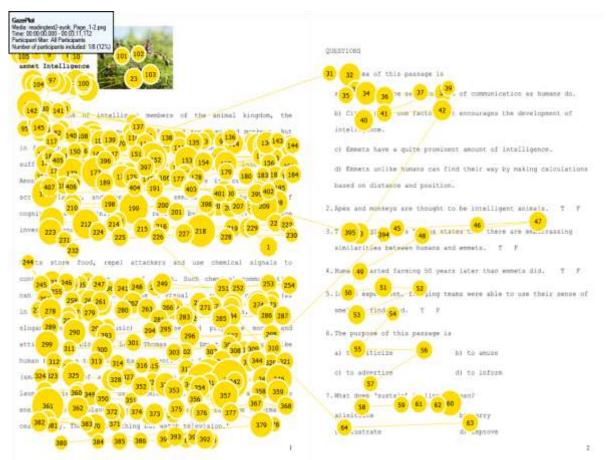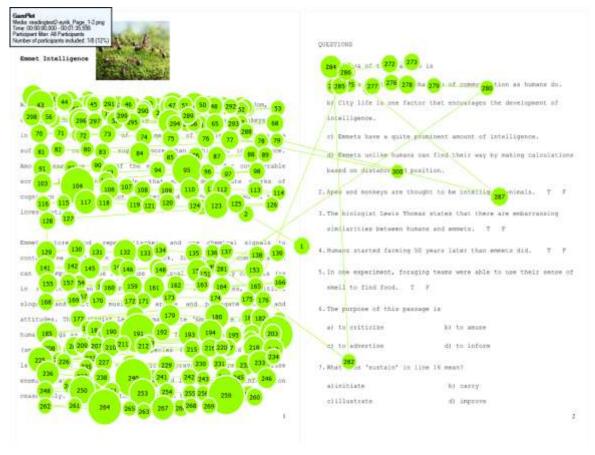Figure 1
Participant 3 Gaze Plot

Figure 2
Participant 6 Gaze Plot

As Tobii Glasses Eye tracker is unable to provide the researcher with visual output, gaze plots of each participant were viewed and analyzed by the researcher together with an audit by a language expert. The findings of the data mirrored similar reading behaviors of participants on a paper test as they were not found flexible in resorting to a variety of strategies. Accordingly, none of the learners showed the inclusion of expeditious reading mode, usually attempting to analyze local level decoding of lexical meanings and global level of comprehension of the text, which is in line with the findings of Hoover and Tunmer (1993). Gazes at questions during reading were observed in four participants; however, they failed to read quickly and to comprehend the main ideas and search for the missing information purposefully. Being aware of the content of the questions did not make them establish the type of reading appropriate for the performance conditions. As an alternative to the quick, purposeful and efficient processing the text, they accessed every part of the text and did not seek specific information such as percentages, figures, and names.

Regarding the second research question that investigated any potential differences among the mediums of reading, mean values on the mean duration of reading and T-test results are given in Table 4:

Table 4
Mean Reading Duration Values and T-test Results

	Mean Duration of Reading	**Mean Scores**	**t**	**p**
Computer test	7 minutes, 2 seconds	6.00	2.291	.056
Paper test	19 minutes, 78 seconds	4.50		

There was a difference in mean scores obtained from two different reading tests. Though the difference is not statistically significant, it is important to note that the p-value is just above the significant threshold, $t(7) = -2.291$, p = .056, which is to be expected given the low number of participants and items.

The facilitative effect of different medium of testing in favor of computer test is apparent in the table. Firstly, online readers spent less amount of time in reading the text as seen in the mean duration of reading on the computer (*M = 7'2''* for computer test; *M = 19'78''* for paper test). This could be interpreted as the relative easiness with computer tests since people are more accustomed to online versions of staples such as calendars, messages, and other means of communication. Also, because the paper enables readers with an opportunity to touch, move and engage with the test, readers took more time to finish the reading assessment.

In addition, the fact that mean scores were higher on computer text than that of the paper text (*M = 6.00; M = 4.50* respectively) is noteworthy. Therefore, the results demonstrate that test takers were facilitated in understanding propositions and abstractions made in the computer test more than the paper test, showing how well they could be involved with online testing.

4. Discussion and Conclusion

Many studies have examined the multi-divisible or unitary nature of the reading (Alderson, 2000; Hessamy & Suldaragh, 2013; Lunzer & Gardner, 1979; Weir et al., 2002). The results of the current study have provided evidence for the view that supports reading as a single, unitary, holistic ability. Reading data were gathered from eye movements that illustrated the psycholinguistic processes of L2 readers, and hence interactively showed what was happening while a task was being performed both on computer and paper tests as opposed to traditional product-oriented methods of ANOVA and factor analysis. In addition, these data do not rely on the subjective understanding of the researcher towards the construct of reading because findings are process-oriented, and therefore, more robust.

Results as to the processes of reading show that mean test scores on both mediums suggested test takers experienced particular difficulty in reading the text on paper and were more profoundly engaged with computer tests, and that gaze plots did not illustrate the use of quick purposeful processes in reading. These results support the findings of Carver (1992), Rosenshine (1980), Weir and Porter (1996) which provided evidence supporting the unidimensional view of reading and failure to differentiate skill components. Therefore, the findings of the present study have cast doubt on the view of reading as the *differentiated* skills activity which could be broken down into underlying sub-skills.

Given the fact that teachers, textbook writers, curriculum makers, administrators put a great deal of effort in preparing and implementing reading materials, defining operations needed for skills and strategies in the curricula and syllabi, the results are significant in that data to show the lack of these underlying subskills in reading. Disuse of expeditious reading for spotting specific information and global understanding during actual tests, even when test takers have received explicit training, suggests the absence of separable reading components. Therefore, there is a deed suspicion of the general practice of providing explicit training to L2 readers on reading strategies.

In the survey, test takers reported they felt very comfortable in both computer and paper tests; however, large differences between the duration of the computer and paper tests as well as higher mean scores on the computer test have technological implications for the field of language assessment. This difference may result from the fact that on online tests, they are confined to computer screens, thereby paying close attention to the activity. However, with pen and paper tests, the opportunity to physically interact with the test, sit as they wish and use the paper to take notes and scribble might slow down the reader. These factors could profoundly affect their test-taking behaviors, and further investigation into these factors is needed.

Test of English as a Foreign Language (TOEFL) and the International English Language Testing System (IELTS) are two internationally recognized tests that people all over the world take for educational, business, migration or for other reasons. These two international tests have two distinct ways of assessing reading comprehension. The most paramount difference is IELTS uses paper, and TOEFL uses computer as the medium of assessment. The current study indicated that participants took relatively more time in responding to the paper test, but this did not lead to more success in terms of the number of correct answers.

This study which sought to reveal whether reading can be divided into underlying skills and strategies also has also pedagogical implications. Despite formal instruction on strategic and skilled reading particularly in tests, L2 readers did not extract necessary information in line

with its necessary and appropriate performance. Accordingly, the quality and quantity of instruction within the scope of cognitive and metacognitive strategies need to be addressed by the teachers of reading as well as administrators that make decisions on the content of these courses.

There are also limitations to this research that should be considered. First, the experiments of the present study could be replicated and validated with a higher number of participants with different backgrounds to get a fuller picture of the reasons underlying the test-taking behaviors of participants. Secondly, this study used only one reading passage for each medium of assessment. Other research should use multiple texts on computer and paper.

Acknowledgments

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Appendix 1:

Survey Questionnaire: Student Information on Computer Use in Higher Education

The questions below are designed to measure your easiness of computer use while taking English tests. Your responses will be used in a study by Hasibe Kahraman.

Name Surname:

Department:

Age:

1. How long have you been using computers? _____
2. Are you a digital native or digital immigrant? _____
3. Do you have computer access at school?   _____
4. Do you have computer access in your house? _____
5. On a scale of 1-5, how do you rate yourself in terms of technology use? _____

6. How comfortable do you feel when you use computers?
- Extremely comfortable
- Very comfortable
- Moderately comfortable
- Not comfortable at all

7. When I take an English test on a computer, I feel
- Extremely nervous
- Very nervous
- Moderately nervous
- Not nervous at all

8. When I take an English test on paper, I feel
- Extremely secure
- Very secure
- Moderately secure
- Not secure at all

9. Taking an English test on computers is better than taking an English test on paper.
- Strongly agree
- Agree
- Disagree
- Strongly disagree

10. Your English Language Proficiency Exam Score:

EPE _____   TOEFL _____   IELTS _____ YDS _____ OTHER _____