



| Research Article / Araştırma Makalesi |

## Comparison of the Effects of Live Reader and Computerized Reading on the Test Achievement of Visually Impaired Students<sup>1</sup>

### Canlı Okuyucu ve Bilgisayar Destekli Okumanın Görme Engelli Öğrencilerin Test Başarıları Üzerindeki Etkilerinin Karşılaştırılması

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#### Keywords

1. Visually impaired students
2. Read aloud accommodation
3. Computerized test
4. Pass from Basic Education to Secondary Education

#### Anahtar Kelimeler

1. Görme engelli öğrenciler
2. Sesli okuma uyarlaması
3. Bilgisayar ortamında test
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#### Abstract

The aim of this study is to investigate whether the reading of the Turkish and math tests prepared by the Ministry of National Education for students with visual impairment within the scope of the transition from basic education to secondary education (TEOG) makes a significant difference in the performance of individuals with visual impairments in the computerized and by the live reader. The study is of quantitative research type and in semi-experimental design. Research group consists of 48 students who are studying in a total of five visually impaired schools in Ankara, Istanbul and Konya. These students are those who receive reader support in exams and do not have any disabilities other than visual impairment. Within the scope of the research, the Voice Test Application Tool in Computerized (BOSTA), which can be used by students with visual impairments, was developed and the effectiveness of the test applied in computerized against this live reader application was tested using this tool. Turkish and mathematics tests were given to 24 of the students in the study group were selected randomly, in computerized and the other 24 were given by a live reader. In order to compare the Turkish and mathematics achievements of the students in the experimental and control groups within the scope of the research, independent samples t-test was applied. As a result of the analysis, no significant difference was found in both tests (between the test in the reading aloud application performed in computerized and the test read by the live reader). This finding shows that the test performed in the computerized is as effective as the test performed with the live reader and can be used in exams. In the research, it was concluded that the test application tool developed within the scope of this study can be used in national exams. It was also stated that the proofs of validity of the accommodations made in the tests should be presented.

#### Öz

Bu araştırmanın amacı, Millî Eğitim Bakanlığı tarafından temel eğitimden ortaöğretime geçiş (TEOG) kapsamında görme engelli öğrencilere yönelik hazırlanan Türkçe ve matematik testlerinin bilgisayar ortamında ve canlı okuyucu tarafından sesli okunmasının görme engelli bireylerin performansında anlamlı fark yaratıp yaratmadığını araştırmaktır. Çalışma nicel araştırma türünde ve yarı deneysel desenedir. Araştırma grubu; Ankara, İstanbul ve Konya'da toplam beş görme engelliler okulunda öğrenim görmekte olan sekizinci sınıfta okuyan 48 öğrenciden oluşmaktadır. Bu öğrenciler sınavlarda okuyucu desteği alan ve görme engeli dışında herhangi bir engelleri bulunmayan öğrencilerdir. Araştırma kapsamında görme engelli öğrencilerin sınavlarda kullanabilecekleri Bilgisayar Ortamında Sesli Test Uygulama Aracı (BOSTA) geliştirilmiş ve bu araç kullanılarak bilgisayar ortamında uygulanan testin canlı okuyucu uygulaması karşısındaki etkililiği test edilmiştir. Türkçe ve matematik testleri çalışma grubunda yer alan öğrencilerden seçkisiz olarak belirlenen 24 öğrenciye bilgisayar ortamında, yine 24 öğrenciye canlı okuyucu ile verilmiştir. Deneysel ve kontrol gruplarında yer alan öğrencilerin araştırma kapsamındaki Türkçe ve matematik başarılarını karşılaştırmak amacıyla bağımsız örneklem için t-testi uygulanmıştır. Yapılan analiz sonucunda her iki testte (bilgisayar ortamında uygulanan sesli okuma uygulamasındaki test ile canlı okuyucu tarafından okunan test arasında) anlamlı farklılık bulunmamıştır. Bu bulgu, bilgisayar ortamında yapılan testin canlı okuyucu ile uygulanan test kadar etkili olduğunu ve sınavlarda kullanılabileceğini göstermektedir. Araştırmada, bu çalışma kapsamında geliştirilen test uygulama aracının ulusal sınavlarda kullanılabileceği sonucuna varılmıştır. Ayrıca testlerde yapılan uyarlamaların geçerlik kanıtlarının da sunulması gerektiği ifade edilmiştir.

<sup>1</sup> Derived from the author's doctoral dissertation.

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## INTRODUCTION

Students are subjected to various tests throughout their education life. The scores obtained from some of these tests are used to make important decisions about students. An example of these can be the exams used to enter high schools and universities (Başpınar Can, Dereboy, & Eskin, 2011). It is expected from test applications to have validity, reliability and usefulness (Tekin, 2004; Turgut & Baykul, 2010), and the applications to be carried out in standard environments. However, standard application of tests with other students prevents visually impaired students from revealing their real performance (Bolt, 2004). Various alternative test adaptations are offered for students with disabilities in order to overcome the obstacles that arise in test applications (Government Accountability Office, 2011).

In order for disabled students to show their real performance, accommodation, modification and adaptation applications are carried out in tests. The aim of these practices is to eliminate or minimize the effect of the characteristics of the disabled person in the structure in which the measurement is aimed (Allan, Bulla, & Goodman, 2003; American Educational Research Association - AERA, American Psychological Association - APA and National Council on Measurement in Education - NCME, 1999. ). Because following different processes for candidates who are determined to be disabled brings along questions about the validity of the exams (Çobanoğlu Aktan, Aksu, & Eser, 2018). Therefore, in order to compare the scores of disabled and non-disabled students, it is necessary to determine that the tests applied to the two groups measure the same structure (Südkamp, Pohl, & Winert, 2015).

According to Allman (2006), test accommodations are applied in order for individuals with disabilities to access academic materials. Kim (2012) stated that visually impaired students have problems in standard tests because they have problems understanding visual materials, and therefore accommodations are applied to visually impaired students, especially in "high-stakes" tests.

The accommodations and modifications made in the exams are evaluated under four headings. These titles are presentation, response, timing and setting. Examples of presentation accommodations include printing the test to the test takers in braille alphabet and larger than normal fonts, or giving the test with alternative applications such as audio cassettes and computer programs. Response accommodations allow candidates to respond to the test in different ways, such as using printers and computers to answer items. Timing accommodations usually include longer than usual exam time, exam breaks, and multiple exam sessions. Setting accommodations include the application of the exam in a special room separate from other candidates, and other different applications for the screens and the environment of the examinees to prevent distractions (American Educational Research Association et al., 1999; Bolt, 2004; Cahalan-Laitusis, 2004; Thurlow, Thompson and Lazarus, 2006). The way in which the read-aloud accommodation is given from the response arrangements constitutes the scope of this research. Read aloud accommodation is provided to visually impaired students in the examinations by human readers (live reader) in Turkey.

In developed countries, for example in the USA, with the above-mentioned regulations, visually impaired students are given test forms printed in braille alphabet or test applications in computer environment (College Board, 2020; Toppo, 2020). In addition, in these countries the evidence for the effectiveness of the accommodations provided for the visually impaired is also empirically researched and presented (Koretz & Barton, 2003). Students are given more time than standard paper and pencil tests in Braille alphabet, printing with large fonts, and vocalization of the items in the test (Allman, 2009). The opinions of the measurement and assessment experts must be obtained for the regulations to be made for students with disabilities in order to reflect their real performance in the tests. It is necessary to examine the effect of the accommodations made in the test on the structure and other types of validity that the test wants to measure (Philips, 1994), the issue of the effect of the characteristics of different levels of disability on the performance obtained from the test and knowledge on this subject. Because what is expected is that the scores obtained from the first form of the test and the scores obtained from the form designed for the benefit of the disabled are comparable with each other (Willingham, Ragosta, Bennett, Braun, Rock, & Powers, 1988).

The first point to be considered in exams prepared for disabled students is the preference and application of the correct accommodation. If suitable arrangements are not made for disabled students, students may get lower scores in these tests. In a study, it was found that 20% of disabled students got lower scores in accommodated exams (Kettler, Niebling, Mroch, Feldman, & Newell, 2003). Therefore, correct test accommodations should be made for students with disabilities.

Especially in the USA, alternative test forms such as computer-voiced test versions are developed for visually impaired students in the tests, the comparability and validity of the test forms are investigated, students' access to tests using technological facilities is increased and new technologies are discovered (College Board, 2020). In

addition, how much additional time will be given to disabled students in the tests and the effect of providing reader support on the measured structure are empirically investigated (Educational Testing Service, 2014). Computer-based test applications are also offered to students with disabilities (Tucker, 2009). Abell and Lewis (2005) stated that individualized computer testing for visually impaired people can be used for visually impaired people. Similarly, in a study in Turkey, it was stated that the developed reading comprehension test can be used as a computerized adaptive test (CAT) for visually impaired students (Şenel & Kutlu, 2018).

Considering the history of the accommodations made in the tests for disabled people, it is seen that the practices in the USA come to the fore. In the USA since the 1990s, firstly "Americans with Disabilities Act" (ADA) (Gordon & Keiser, 2000), then "No Child Left Behind Act" (NCLB) studies (Simpson, Lacava, & Graner, 2004) and With the "Improving America's Schools Act" law (Le Tendre, 1996), students with disabilities are gradually being included in the assessment in national and many federal assessment programs.

There are two major testing center makes the transition exam between stages in Turkey. These are the Assessment, Selection and Placement Center (ÖSYM) and the Ministry of National Education (MEB) General Directorate of Measurement, Evaluation and Examination Services. Visually impaired students are divided into two categories in the transition to high schools exam (LGS). Both groups are given additional time. In addition, students with low vision are given a reader coder or a question booklet in 18 pt. Live reader, coder support is provided to total visually impaired students (MEB, 2019). In the system before this application, Transition from Basic Education to Secondary Education (TEOG); Turkish, mathematics, science and technology, history of revolution and Kemalism, religious culture and moral knowledge, and foreign language courses were prepared based on the 8th grade curriculum. The tests were applied twice, in the first and second terms. In this exam practice, the visually impaired, as in the current system; "Students with low vision" and "students with total visual impairment (no vision)" were treated under two groups and accordingly, various test accommodations were provided in the exam. Students with low vision could take the exam in single halls if they wish, and these students were given an additional 15 minutes of time for each test. Students with low vision were provided one of the following accommodations (a) reader and coder, (b) an 18-point question booklet and answer sheet, and (c) an 18-point question booklet and answer sheet with the reader coder. Total visually impaired students were also given an additional 15 minutes for each test and these students were taken to the exam in single-person halls. In addition, these students were provided with reader and coder support. There is no question exemption for the visually impaired in TEOG; instead of questions containing pictures, figures and graphics, equivalent questions were used (Ministry of National Education, 2013). Any research wasn't found, regarding the effect of these time arrangements for visually impaired students on students' achievement, done in Turkey. However, visually impaired students think that the given time is insufficient (Doğuş, Aslan, & Çakmak, 2020).

ÖSYM makes accommodations in parallel with MEB for the exams for visually impaired students. However, unlike MEB applications, no alternative questions are written instead of questions containing figures and graphics, and these questions are excluded from the exams of total visually impaired students (Measurement, Selection and Placement Center, 2014). ÖSYM previously (until 2014) prepared a question booklet in 14 point size for students with low vision. However, as of 2015, it prepared 14, 18 and 22 pt size exam booklets (Measurement Selection and Placement Center, 2015). ÖSYM returned to the practices before 2015 and stated that in the Higher Education Institutions Exam Guide for 2020, visually impaired students were provided with the opportunity of a 14-point booklet (Measurement, Selection and Placement Center, 2020). Also, only live reader support is given to visually impaired students in Open Secondary School and Open Education High School exams by MEB. There is no practice such as editing the questions asked in the test or removing the questions containing a shape from the test. It is thought that this situation prevents students from performing their real performance.

Visually impaired students are given reading by live reader [CO] accommodation in Turkey. It is stated that this regulation alone is not enough for students to provide their real performance (Sitlington, Clark, & Kolstoe, 2000). Visually impaired students are experiencing difficulties to the reader and encoder accommodation in Turkey (Doğuş et al., 2020; Karabay, and Demirtaşlı, 2018; Şenel, 2014, Tavşancıl, Uluman and Furat, 2012). They also think that their exam success depends on the reader who read the questions to them (Şenel, 2014).

Read aloud accommodation has been found to be generally useful for visually impaired students in exams (Elbaum, 2007; Elliott, Kratochwill, & McKeivitt, 2001; Kim, 2012; Li, 2014; Sireci, Scarpati, & Li). When the read aloud accommodation is made by a live reader (human), some readers read the questions to give clues to the students (Karabay & Demirtaşlı, 2018). This is considered a serious problem. Generally speaking, read aloud accommodation with live readers has been found to be more effective than reading aloud arrangement with computer or cassette / CDs. One of the reasons for this is that cassette / CD or software read questions at a constant speed (Li, 2014).

In exams, which are used as a transition between levels, alternative item writing, live reader support and additional time are given to questions containing figures for visually impaired students. It is important to provide these students with the opportunity to apply tests in a computer environment without being dependent on others. Testing the effectiveness of this application with a live reader will provide important information about its usefulness. The problem of this research is to test the effectiveness of the Computerized Audio Test Implementation Tool (BOSTA) application against the live reader. It is thought that with this research, suggestions that will shed light on the exam practices of visually impaired students will be obtained to researchers, decision makers and test centers.

## Purpose

The general aim of this study is to investigate whether presenting TEOG Turkish and mathematics tests to visually impaired individuals with two different test application approaches creates a significant difference in the performance of visually impaired individuals. These two test application approaches are read aloud in computer environment and read aloud by the reader. In line with this general purpose, answers to the following questions were sought:

1. What is the test statistics regarding the scores of visually impaired students obtained as a result of the application of Turkish and mathematics tests in Computer Environment (BO) and Live Reader (CO) in Transition Exam from Basic Education to Secondary Education? Is there a significant difference between the test statistics and scores obtained from the two applications?
2. Is there a significant relationship between the Turkish and mathematics scores of the students obtained from the tests applied with BO and CO, their year-end success scores and the 2014-2015 TEOG II Turkish and mathematics scores?

## METHOD

The research was designed as a quasi-experimental study from quantitative research designs. The dependent variable in the study is the scores the students obtained from the visually impaired forms of Turkish and mathematics tests in the TEOG applied in the second term of the 2013-2014 academic year. The independent variable is the presentation of the tests to the students. The group in which the BO application was applied was called the experiment group, and the group in which the CO application was applied was called the control group. The schematic representation of the research is given in Table 1.

**Table 1. Schematic representation of the study.**

BO	R	X	O <sub>a</sub>
CO	R		O <sub>b</sub>

X: Manipulation, O<sub>a,b</sub>: Measurement, R: It shows that there is no random selection from the universe, and random assignments are made to the experimental and control groups.

When Table 1 is examined, it is seen that the experimental group was applied BO and the control group was applied CO. A quasi-experimental model was established in the research. In the study in which the randomized posttest-only control group design was used (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2011; Fraenkel, Wallen, & Hyun, 2012), two groups, experimental and control were created randomly. In this study, the practice of read aloud in the form of BO represents experimental manipulation. Therefore CO, BO application is not applied and the test with CO is the common application condition, is considered as a control condition. The scores of visually impaired students in Turkish and mathematics tests were considered as dependent variables. The Turkish and math tests of the 2014 TEOG exam were read aloud via computer to the students in the experimental group. For the control group, the reading aloud of the same subtests was done with CO, as applied by MEB in TEOG.

It is possible for an experimental research to examine the causality relationship by controlling all variables except independent and dependent variables (Howitt & Cramer, 2008). In this study, random assignments were made primarily to the experimental and control groups in order to control other variables except independent and dependent variables (Krathwohl, 1997). In addition, in both test applications, both groups were given equal test taking time, and students' test taking environments were provided to be similar.

The research group consists of 48 eighth grade students who were given reader support in TEOG applications by MEB in a total of five secondary schools for the visually impaired in Ankara, Istanbul and Konya in the 2014-

2015 academic year. 24 students selected randomly were included in each of the experimental and control groups. The demographic information of the students is given in Table 2.

**Table 2. Demographic information of the students in the research group**

City	Ankara		İstanbul				Konya		Total		
School	Mitat Enç	Göreneller	Türkan Sabancı	Veysel Vardal	Selçuklu						
Group	F	M	F	M	F	M	F	M			
BO	3	2	3	1	4	4	1	3	2	1	24
CO	3	2	3	1	4	4	0	3	4	0	24
Total	6	4	6	2	8	8	1	6	6	1	48

F: Female; M: Male

When Table 2 is examined, it is seen that the most students are in Istanbul ( $n = 23$ ) and the least students are in Konya ( $n = 7$ ). There are 18 students in Ankara. In addition, it is observed that students attend two secondary schools for the visually impaired in Istanbul and Ankara and one in Konya. It is seen that the distribution of students according to their gender in total is balanced. The students in the research group were divided in two categories as "total visually impaired" and "low vision" as MEB did. "Total visually impaired" are students who do not see at all or only feel the light, and "low vision" is the students who are informed by the guidance and research centers that they cannot read the 18-point booklet given by MEB in the TEOG. The study included all students who were studying in the eighth grade in five visually impaired secondary schools and who did not have any disability other than visual impairment; Students with disabilities other than visually impaired and sighted enough to be able to read the 18-point booklet were not included.

In this study, two success tests were used as data collection tools. One of them is the TEOG Turkish test administered in April 2014, the other is the TEOG math test booklet for the visually impaired administered in April 2014. Both tests consist of 20 multiple-choice items. While TEOG tests are developed based on expert opinion, empirical evidence is not included. However, one of the important stages of test development is testing items and predicting their psychometric properties (Crocker & Algina, 1986). KR-20 reliability values of the Turkish and mathematics tests used within the scope of the study were calculated with the data obtained from the students participating in the study and are given in Table 3.

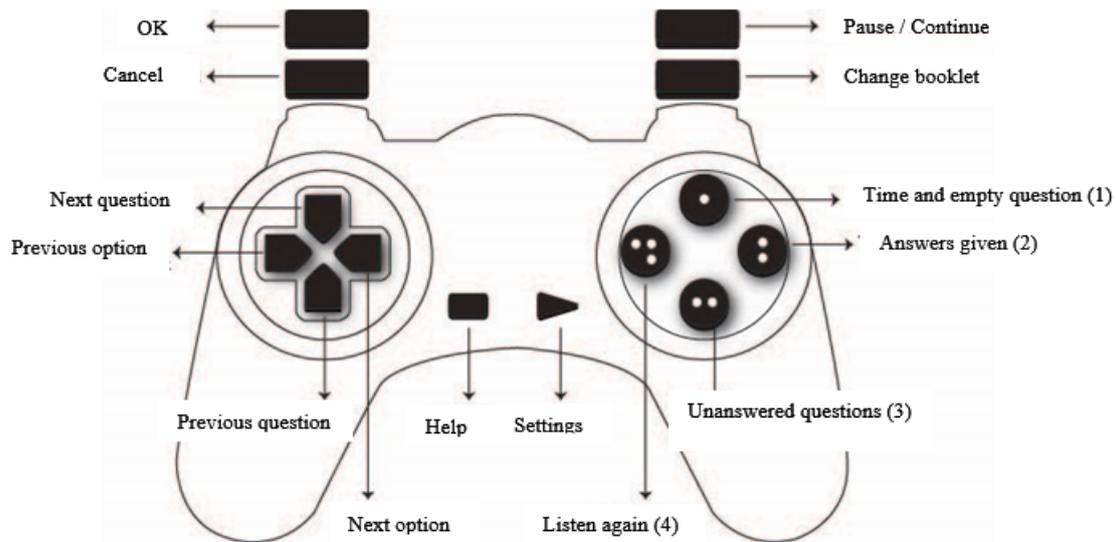
**Table 3. 2013-2014 academic year TEOG 2 Turkish test (booklet A) test statistics**

Values	TEOG Turkish	TEOG Mathematics
Number of Items	20	20
$\bar{X}$	13.67	8.93
S	5.03	4.29
Skewness	-0.53	0.77
Curtosis	-0.73	-0.01
Minimum	0	0
Maximum	20	20
Median	15	8
SEM	1.72	1.97
Average difficulty	0.68	0.45
Average discrimination (biserial)	0.75	0.58
KR-20	0.88	0.79

When Table 3 is examined, it is seen that the reliability of the TEOG Turkish test booklet A is high, and the reliability of the TEOG mathematics test is medium. When the average difficulty of the TEOG Turkish and mathematics tests A booklets is evaluated, it can be stated that the Turkish test is easy and the mathematics test

is medium difficulty. The data used in the study were collected by the researcher himself by going to the visually impaired secondary schools in Ankara, Istanbul and Konya.

Within the scope of the study, a tool called Audio Test Application Tool in Computer Environment (BOSTA) was developed. According to the preliminary interviews and observations made to the visually impaired students and teachers who attend the classes of these students, it was concluded that the screen-reading software currently used for the visually impaired did not meet the needs and it was decided to develop BOSTA. Visually impaired users have stated that screen-reading software can skip words, so they may be at a disadvantage in exams. While developing the tool, the literature was scanned and interviews were made with visually impaired students and their teachers. BOSTA was developed using the game console (joystick) where ready-made audio files can be used and its schematic representation is given in Figure 1.



**Figure 1. Schematic representation of the remote and the functions of the keys**

When Figure 1 is examined, it is seen that you can move forward in questions and options with the buttons on the left of the control, and by using the keys on the right, some features that are not available in other software but are available in BOSTA can be used. The "Help" and "Settings" menus can be accessed on the middle keys. Students who took the BO application were trained to use BOSTA effectively.

SPSS 22 and ITEMAN 3.5 programs were used to analyze the data. Whether the data showed a normal distribution was examined. According to Table 3, it was concluded that Turkish test was normally distributed in both the experimental and control groups, and the mathematics test was not normally distributed. The mean, standard deviation, median, peak value, and KR-20 reliability coefficient of the test, item difficulty and item discrimination values for the items were calculated using the ITEMAN 3.5 program. The  $W$  value suggested by Alsawalmeth and Feldt (2000) was calculated in order to examine the difference in the obtained KR-20 reliability levels. Equality is given below:

$$W = \frac{(1 - \alpha_2)}{(1 - \alpha_1)} \quad \text{Equality 1}$$

$\alpha_1$ : Reliability coefficient of the 1st test

$\alpha_2$ : Reliability coefficient of the 2nd test

Whether the scores obtained from the BO and CO applications differ according to the group was calculated by independent samples t-test. In order to answer the third research question, students' year-end achievement, Turkish, mathematics, TEOG Turkish and TEOG math scores were correlated with each other and their rank differences were calculated with Spearman's correlation coefficient.

## FINDINGS

### The Level of Test Statistics Regarding the Scores Obtained by the Visually Impaired Students as a Result of BO and CO Applications of Turkish and Mathematics Tests and Comparison for Two Applications

Table 4 shows the test statistics obtained from BO and CO applications of Turkish and mathematical tests.

**Table 4. Values of Turkish and mathematical tests obtained from BO and CO applications**

Values	Turkish		Mathematics	
	BO	CO	BO	CO
Number of items	20	20	20	20
$\bar{X}$	11.63	11.33	6.54	7.42
S	4.73	5.02	2.08	2.89
Skewness	.11	-.09	.26	.72
Curtosis	-1.21	-.96	-.98	.14
Minimum	4.00	2.00	3.00	3.00
Maximum	20.00	20.00	11.00	15.00
Median	11.00	10.00	6.00	7
SEM	1.83	1.86	2.05	2.02
Average difficulty	.58	.57	.33	.37
Average discrimination (biserial)	.51	.53	.22	.31
KR-20	.85	.86	.03	.51

When Table 4 is examined, it is seen that KR-20 reliability values of .85 in BO application and .86 in CO application are obtained for the Turkish test. It is seen that the reliability for the math test is low for both applications (.03 for BO, .51 for CO). Turkish tests can be expressed medium difficulty, and mathematics tests can be called difficult.

The Felt test was used to compare the KR-20 reliability coefficients obtained from the BO and CO applications of Turkish and mathematics tests. Felt test results of the relevant tests are given in Table 5.

**Table 5. Reliability comparisons of BO and CO applications of Turkish and mathematics tests**

Method of Application		N	k	KR-20	W
Turkish	BO	24	20	.85	.93
	CO	24	20	.86	
Mathematics	BO	24	20	.03	.51
	CO	24	20	.51	

According to Table 5, no significant difference was found between the KR-20 reliability coefficients calculated as a result of the BO (experiment) and CO (control) applications of the Turkish test,  $W < F(23, 23)$ . A significant difference was found between the KR-20 reliability coefficients calculated as a result of the application of the math test BO and CO,  $W > F(23, 23)$ . The reliability value of the CO application for the mathematics test was found to be higher than the reliability coefficient obtained from the BO application.

In order to examine the difference between the Turkish mean scores of the students according to the group, the normality test was performed according to the group and the skewness and kurtosis values were examined. Independent samples t test result for scores showing normal distribution is given in Table 6.

**Table 6. Comparison of the Turkish scores of the students according to the way of giving the reading aloud arrangement (BO and CO)**

Group	N	$\bar{X}$	S	df	t	p
Experimental (BO)	24	11.63	4.84	46	.20	.840
Control (CO)	24	11.33	5.13			

When Table 6 is examined, it is seen that there is no significant difference between the Turkish test success averages of the students in the experimental (BO) and control (CO) groups,  $t(46) = .20$ ,  $p > .05$ . This finding shows that the way the arrangement of reading aloud does not affect students' Turkish achievement. Accordingly, BO application is as effective as CO application in terms of Turkish achievement of visually impaired students. Visually impaired students who took the Turkish test with the computer application succeed at the same level as those who took the same test with a live reader.

Similar to the Turkish test, the math test scores were also examined to see if they showed a normal distribution according to the group, and it was found that they showed a normal distribution. In order to examine the significance of the difference, independent samples t test was conducted and the analysis result is given in Table 7.

**Table 7. Comparison of students' math scores according to the way in which the reading arrangement is given (BO and CO)**

Group	N	$\bar{X}$	S	df	t	p
Experimental (BO)	24	6.54	2.13	46	-1.18	.244
Control (CO)	24	7.42	2.95			

When Table 7 is examined, it is seen that there is no significant difference between the mathematics scores of the students according to the way in which the read aloud accommodation is given.;  $t(46) = -1.18$ ,  $p > .05$ . In other words, students' taking the TEOG math test as BO or CO affected their mathematics achievement equally. This finding shows that the BO application is as effective as the live reader in terms of the mathematics achievement of visually impaired students.

#### **Turkish and Mathematics Scores of Students from Tests Applied with BO and CO; Relationship with Year-End Success Scores and 2014-2015 TEOG II Turkish and Mathematics Scores**

TEOG mathematics scores of the students in the experimental and control groups do not show a normal distribution. Therefore, Spearman's rank difference correlation coefficient was used to calculate the correlations between year-end, Turkish, mathematics, TEOG Turkish and TEOG mathematics scores of the students in the experimental and control groups. Spearman rank differences correlations between the end of year, Turkish, mathematics, TEOG Turkish and TEOG mathematics scores of the students in the experimental and control groups are given in Table 8.

**Table 8. Relationships between year-end, Turkish, mathematics, TEOG Turkish and TEOG mathematics scores of students in the experimental and control groups (n = 24)**

Variables	Year-end	Turkish		TEOG Turkish		Mathematics		TEOG Mathematics	
		BO	CO	BO	CO	BO	CO	BO	CO
Year-end		.79**	.74**	.57**	.75**	.20	.58**	.57**	.34
Turkish				.40	.82**	.12	.43*	.44*	.37
TEOG Turkish						-.14	.44*	.58**	.40
Mathematics								.08	.31
TEOG Mathematics									

\*\*  $p < .01$ ; \*  $p < .05$

When Table 8 is examined, it is found that the BO and CO application of the Turkish test has a positive and significant relationship with the year-end success score,  $p < .01$ ; in the mathematics test, while the CO application shows a significant correlation,  $p < .01$ , it is seen that the BO application does not show a significant correlation,  $p > .05$ . While the CO applications of the Turkish and mathematics tests showed a significant correlation with the TEOG Turkish and TEOG mathematics scores,  $p < .05$ , the BO applications of the same tests did not show a significant correlation,  $p > .05$ . On the other hand, while the TEOG mathematics scores of the students who took the BO application showed a significant correlation with the year-end, Turkish and TEOG Turkish scores,  $p < .05$ , the TEOG mathematics scores of the students who took the CO application did not show a significant correlation,  $p > .05$ . Only according to the correlation values, it can be stated that the application of CO in the Turkish test is more related to the school success scores, and the BO application in the Mathematics test is more related to the school achievement scores.

## DISCUSSION

In this study, which examines the differences in the success of visually impaired students by applying the TEOG Turkish and mathematics tests visually impaired test forms with two different read-aloud approaches as BO and CO, a significant difference has not been found between the mean scores obtained from the BO application and the CO scores for both Turkish and mathematics tests. Accordingly, the BOSTA application has equal efficiency with a live reader. The result obtained from this study is consistent with the research that Calhoun et al. (2000) applied the practice of read aloud in live reader and computerized test and there was no significant difference. Laitusis et al. (2012) stated that reader-based misreading, diction disorders, etc. can be prevented and new and different experimental researches are needed regarding the accommodations applied in computers and other technological environments together with technological developments. Unlike the results of this research, it has been found in most studies that the read aloud accommodation given by a live reader is more effective than the application in computer environment (Li, 2014; Meloy, Deville, & Frisbie, 2002; Olson & Dirir, 2010). It is thought that some readers' reading the items in a way that gives clues to visually impaired students plays an important role in making the human reader appear more effective (Koretz & Hamilton, 2000). In this study, meetings were held with the readers and they were informed about not helping the students. However, some readers may have helped. Nevertheless, the similarity of CO and BO applications shows the effectiveness of the developed BOSTA. In addition, another reason why the computer application was not as effective as the live reader in previous applications may be that the software technology is not sufficiently developed. Although it is not directly related to the read aloud accommodation, it is stated that computer applications can be applied to visually impaired students in exams (Abell & Lewis, 2005; Şenel & Kutlu, 2018).

## CONCLUSION AND RECOMMENDATIONS

The level of the test statistics regarding the scores of the TEOG Turkish and mathematics visually impaired tests as a result of BO and CO applications and whether there is a significant difference between these statistics were investigated. No significant difference was found between the reliability levels of the Turkish test obtained as a result of BO and CO applications. Accordingly, it can be stated that BO and CO applications have similar levels of reliability in terms of the Turkish test. For the mathematics test, the reliability coefficient obtained from the BO application was found to be significantly lower than the reliability coefficient obtained from the CO application. The reason for this may be that instead of nine items in the mathematics test, new items that are stated to measure the same gain were written, but these items were directly included in the test without being tested. It is also necessary to conduct different studies for what other reasons may be.

When the correlations between the scores obtained as a result of the BO and CO applications of the Turkish and mathematics tests and the TEOG Turkish and TEOG mathematics scores were examined, inconsistent results were obtained. For BO application; There was no significant correlation between the scores obtained from the Turkish and mathematics tests and the TEOG Turkish and TEOG mathematics scores and the scores obtained from the mathematics test at the end of the year. For the CO application, the Turkish and TEOG Turkish scores did not show a significant correlation with the scores obtained from the Mathematics test.

In this study, the arrangement of reading aloud in computer environment or by a live reader was examined with an application at secondary school level. Farklı öğrenim düzeylerinde (Lise ve üniversite) de benzer araştırmalar yürütülebilir. Different from this research conducted in Turkish and mathematics tests, research can be done for other courses.

In this research, only the read aloud accommodation was studied. Research may also be conducted on other testing arrangements, particularly those involving technology.

Test arrangements and adaptations using computer facilities are becoming widespread. Exam centers in Turkey may provide these adaptations and adaptations for the use of disabled students. They may also change the personnel structure, which is currently limited in this regard.

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## Statements of publication ethics

I hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

## Ethics Committee Approval Information

Since the study was completed in 2016 and consisted of a doctoral thesis, there is no ethics committee approval certificate.

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