



## Research Paper

# Quality of Life With and Without Using Smart Phone Among Visually Impaired People



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## ABSTRACT

**Background and Objectives:** The quality of life (QoL) of blind people is affected by various variables, including age, sex, level of education, severity of low vision, use of applications and software, etc. This research aims to compare the QoL of people with low vision who use and do not use low-vision applications on smartphones.

**Methods:** The statistical population included all patients with low vision who were referred to low vision research centers and other institutions active in the field of blindness and low vision in Tehran City, Iran. The sample size of this study was 43 people using the conviniece sampling method and Cochran's formula, which was considered to be 90 people due to the existence of two groups for comparison. The research data collection tool was Hakimzadeh Yazdi's QoL questionnaire (2022). Two-way one-variable analysis of variance and SPSS software, version 21 were used to analyze the data.

**Results:** The results showed that people with low vision who use low-vision applications have a higher QoL compared to people with low-vision who do not use low-vision applications ( $P < 0.05$ ). Also, the effect of demographic variables on the QoL of low-vision patients using and not using applications was presented ( $P < 0.05$ ). Age and gender had no significant effect on QoL.

**Conclusion:** Considering the impact of applications in facilitating the daily affairs of low vision patients, it is recommended to use it in treatment and educational programs in hospitals and even in the family.

**Keywords:** Quality of life (QoL), Low vision, Smartphone



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↑ *What is “already known” in this topic:*

*One of the ways to improve the quality of life (QoL) of visually impaired people is to design and use applications that can be run on smartphones, computers, and tablets. These programs can easily cover a wide range of activities and deeply affect the daily life and comfort of patients living with low vision.*

→ *What this article adds:*

*Low-vision people who use low-vision applications have a higher QoL compared to people with low-vision who do not use low vision applications.*

## Introduction

Low vision is the third factor in the world that causes people over 70 to rely on another person to do their daily tasks [1]. If the vision with the best optical correction is between 20/70 and 20/200 or the visual field is narrowed to 20 degrees, the patient has low vision [2]. It is estimated that currently, more than 280 million people worldwide suffer from low vision and the population of visually impaired people will reach about 1.1 billion people worldwide by 2050 [3]. With the increase in life expectancy and age-related diseases, such as diabetic retinopathy or age-related macular degeneration, the number of visually impaired people is expected to increase [4-6].

Low vision is a major disability that has many negative effects on personal and social aspects and consequently on people's quality of life (QoL) [7-10], which depends on various factors, such as age, sex, socio-economic level, severity of the disorder, age. The onset of the disorder has different effects on different people [11]. QoL is defined as people's understanding of their position in life in the context of the culture and value systems in which they live and about their goals, expectations, standards and concerns [12]. Factors, such as the patient's age and the patient's visual acuity level play a significant role in the QoL, in such a way that with increasing age and decreasing visual acuity, the level of patient satisfaction has decreased [7, 13].

Nowadays, one of the ways to improve the QoL of visually impaired people is to design and use applications that can be run on smartphones, computers, and tablets [14-16]. These programs can easily cover a wide range of activities [17, 18] and deeply affect the daily life and comfort of patients living with low vision [7, 19, 20]. Research has also shown that systems with less complexity are more successful than more complex systems and bring higher satisfaction [7].

In this research, it is tried to find more comprehensive factors of the individual conditions of visually impaired patients, such as education level, social and economic level, the level of awareness of these applications, etc. which play a significant role in determining the QoL of visually impaired people and leading to various results in the QoL of visually impaired people. As a result, this research was conducted to evaluate the impact of these applications on the QoL of visually impaired people, which has not been comprehensively investigated so far. Also, the results of this study can provide a basis for starting a new field in vision rehabilitation and new training for visually impaired people. Therefore, this research was conducted to determine the QoL in people with low-vision who use and do not use low vision applications in smartphones.

## Methods

The method of the current research is descriptive, analytical, and cross-sectional of causal-comparative type. The statistical population of this research includes all patients with low-vision who were referred to low vision research centers and other institutions active in the field of blindness and low-vision (Negah and Nioor Ophthalmology hospitals) in Tehran. The participants of the present study included 90 visually impaired people.

### Study sample size

The participants of the present study included 100 visually impaired people who were obtained using the convenience method and Cochran's formula. The inclusion criteria included people whose best-corrected vision was worse than 20/70 in the worse eye, people who use the application at least once a day, and people with different visual acuity (regarding the severity of low vision, in this study, people with different levels of low vision, including people with vision up to 20/400 [mild low vision], people with count finger (CF) and hand motion (HM)

[moderate low vision], and people with light perception (LP) vision and no light perception (NL) [extreme combine] were involved.). It should be noted that the type of low vision (congenital or acquired) was not investigated in this study.

### Inclusion and exclusion criteria

The exclusion criteria included people who could not use the audio services of applications due to hearing problems, people who were not satisfied for any reason, or people who did not want to participate in a research study. The tools used include an authentic Persian questionnaire to assess the QoL related to low vision, which was designed by Hakimzadeh Yazdi and its validity and reliability have been proven, is used in the form of an interview to assess the QoL. This Persian questionnaire has 32 items and is designed in two practical parts (13 questions) and an interview (19 questions) with 5 options for each item. Since this tool has 32 questions, each question can have 5 answers (zero, one, two, three, four) (in order from low to high), therefore the highest score is 128 and the lowest score is 0 [21].

### Study data collection

This study is a cross-sectional study that will be conducted after approval on about ninety people if they have consent and have the inclusion criteria and no exclusion criteria. It examines low vision research and other institutions active in the field of blindness and low vision. The first group includes all visually impaired patients with the highest corrected visual acuity of less than 20/70 (based on the standard Log Mar chart) who use low vision applications that can be installed on smartphones and the second group includes all visually impaired people who do not use smartphones. It should be mentioned that various audio applications were used in this research. Since this study was a cross-sectional study in which no intervention was performed on the participants. Meanwhile, in this study, all the clauses of the ethical principles of the Declaration of Helsinki were observed; for example, all the patients were included in the study with informed consent and the data and names of the participants in the study were kept confidential and destroyed after the study, and each of the subjects, for any reason, at any stage of the realization of the test. They refused," and were removed from the study without coercion and politely. It should be noted that the rights of [Iran University of Medical Sciences](#) are reserved for the publication of any article from this study.

### Study statistical analysis

For statistical analysis, two-way one-variable analysis of variance and SPSS software, version 21 were used.

### Results

The demographic characteristics of the participants in the present study included age, sex, education level, age of low vision and visual acuity. In this study, 7 women (34%) and 33 men (66%) used the applications and 22 women (44%) and 28 men (56%) did not use the applications. The Mean±SD of the age of people using low vision applications were 37.56 and 17.87 years, respectively and in the non-user group, 39.52 and 21.33 years, respectively. The level of education of the sample included 13 people with a bachelor's degree (26%), 21 people (42%) with a diploma and 16 people (32%) with a bachelor's degree and above in the people using the applications. Also, 19 people (38%) were under diploma, 18 people (36%) diploma and 13 people (26%) bachelor's degree and above non-users of applications. Also, in the group using low vision applications, 10 people (20%) had severe vision loss, 15 people (30%) had moderate vision loss, and 25 people (50%) had low vision. In the group not using low vision applications, 11 people (22%) had severe vision loss, 22 people (44%) had moderate vision loss, and 17 people (34%) had low vision. The Mean±SD of the QoL in the women participating in the group using the low vision appliques were 71.47 and 12.76 and in the men of that group were 70.72 and 11.51, respectively. The Mean±SD of the QoL in the women participating in the non-user group of low vision appliques were 63.00 and 13.66 and in the men of that group were 66.46 and 13.30, respectively. [Table 1](#) presents the descriptive findings (Mean±SD of QoL according to demographic variables of participants who use and do not use low vision applications) in the present study.

To test the research hypotheses, a two-way one-variable analysis of variance was used. [Table 2](#) presents the main effects and the interaction effect (gender×use/non-use of the application) in explaining the QoL.

The first hypothesis: The life quality of low-vision people who use and do not use low-vision applications is different.

[Table 2](#) shows that the main effect of the group ( $P < 0.05$ ,  $F = 5.91$ ) is significant at the 0.05 level. Using the Benferoni test showed that people with low-vision who use low vision applications have obtained higher average scores compared to people with low-vision who do not

**Table 1.** Descriptive findings of QoL according to demographic variables of participants who use and do not use low vision applications

Participants	Variables	Mean±SD	
Application user with low vision	Age	37.56±17.87	
	QoL and sex	Women	71.47±12.76
		Men	70.72±11.51
	QoL and level of education	High school	74.31±11.56
		Diploma	70.95±10.72
		Bachelor's degree and higher	68.31±12.11
	QoL and visual acuity	Weak	74.40±8.53
		Medium	60.87±10.31
		Low vision	75.68±9.59
	Non-user of low vision applications	Age	39.52±21.33
QoL and sex		Women	63.00±13.66
		Men	66.46±13.30
QoL and age (y)		<25	65.50±12.41
		26-35	62.90±15.31
		>35	65.42±13.68
QoL and level of education		High school	64.21±11.69
		Diploma	68.00±15.05
		Bachelor's degree and higher	65.42±13.40
QoL and visual acuity		Weak	56.45±13.30
	Medium	61.22±11.19	
	Low vision	75.23±9.60	

use low-vision applications. Therefore, in the test of the first hypothesis, it was concluded that people with low-vision who use low-vision applications have a higher QoL compared to people with low-vision who do not use low-vision applications. Second hypothesis: The life quality of women and men with low-vision is different. Based on the results of [Table 1](#), gender ( $P<0.05$ ,  $F=0.27$ ) was not significant at the 0.05 level. Therefore, in the test of the second hypothesis, it was concluded that no significant difference is observed between the life quality of women and men with low-vision. The third hypothesis: The life quality of low-vision people who use and do not use low-vision applications is different based on gender.

[Table 2](#) shows that the interaction effect of group x gender in explaining the QoL ( $P<0.05$ ,  $F=0.65$ ) of visually impaired people is not significant at the level of 0.05. Therefore, in the test of the third hypothesis, it was concluded that the QoL of people with low-vision who use and do not use low-vision applications is not statistically different based on gender. [Table 3](#) shows the main effects and the interaction effect of age×use/non-use of the application in explaining the QoL.

Fourth hypothesis: A difference is observed between the life quality of low-vision people with different age levels.

**Table 2.** The main effects and interaction effect (gender×use/non-use of the application) in explaining the QoL

Scale	MS	df	F	P	$\eta^2$
Group	952.13	1	5.91	0.017	0.058
Gender	43.48	1	0.27	0.270	0.003
Group×gender	103.96	1	0.65	0.424	0.007

MS: Mean square;  $\eta^2$ : Eta-squared.

Average squared error=161.21; Degree of freedom error=96.

Based on the results of Table 3, age ( $P<0.05$ ,  $F=0.61$ ) was not significant at the 0.05 level. Therefore, in the test of the fourth hypothesis, it was concluded that no significant difference is observed between the QoL of visually impaired people with different age levels. Fifth hypothesis: The life quality of low-vision people who use and do not use low-vision applications is different based on age.

Table 3 shows that the interaction effect of group×age in explaining the QoL ( $P<0.05$ ,  $F=0.13$ ) of visually impaired people is insignificant at the 0.05 level. Therefore, in the test of the fifth hypothesis, it was concluded that the QoL of low-vision users and non-users of low-vision applications is not statistically different based on age. Table 4 presents the main effects and the interaction effect of the level of education×use/non-use of the application in explaining the QoL. The eighth hypothesis: A difference is observed between the life quality of low vision people with different visual acuity. Based on the results

of Table 5, the main effect of visual acuity ( $P<0.001$ ,  $F=18.37$ ) was significant at the 0.001 level. Using the Benferroni test showed that no significant difference is observed between the QoL of visually impaired people compared to people with moderate visual impairment, but visually impaired people compared to weakly impaired people have a higher QoL. Also, the use of Benferroni test showed that moderately visually impaired people have a higher QoL compared to severely visually impaired people. Therefore, in the test of the eighth hypothesis, it was concluded that visually impaired people and people with moderate visual impairment have a higher QoL compared to weakly impaired people. Ninth hypothesis: The QoL of people with low vision who use and do not use low vision applications is different based on visual acuity. Table 5 shows that the interaction effect of group×visual acuity in explaining the QoL ( $P<0.001$ ,  $F=5.88$ ) of visually impaired people is significant at the level of 0.001. Therefore, in the test of the seventh hy-

**Table 3.** The main effects and the interaction effect of age×use/non-use of the application in explaining the QoL

Scale	MS	df	F	P	$\eta^2$
Group	766.06	1	4.68	0.0033	0.047
Age	100.47	1	0.61	0.54	0.013
Group×gender	20.87	1	0.13	0.880	0.003

MS: Mean square;  $\eta^2$ : Squared.

Average squared error=163.70; Degree of freedom error=94.

**Table 4.** The main effects and the interaction effect of the level of education×use/non-use of the application in explaining the QoL

Scale	MS	df	F	P	$\eta^2$
Group	1031.51	1	6.44	0.013	0.064
Level of education	191.69	2	1.20	0.307	0.025
Group×gender	110.13	2	0.69	0.505	0.014

MS: Mean square;  $\eta^2$ : Root mean square.

Average squared error=112.01; Degree of freedom error=94.

**Table 5.** The main effects and interaction effect of visual acuity×use/non-use of application in explaining the QoL

Scale	MS	df	F	P	$\eta^2$
Group	808.91	1	7.22	0.009	0.071
Gender	2057.28	2	18.37	0.001	0.281
Group×gender	658.02	2	5.88	0.001	0.111

MS: Mean square;  $\eta^2$ : Root mean square.

Average squared error=112.01; Degree of freedom error=94.

pothesis, it was concluded that an interaction is observed between the QoL of visually impaired people in terms of visual acuity and the use/non-use of low vision applications. No significant difference is observed between users and non-users of applications in weak and medium vision impaired people, but visually impaired people who use low vision applications are compared to non-users of low vision applications. Those applications have a higher QoL.

## Discussion

This research was conducted to “compare the QoL of people with low vision who use and do not use low vision applications on smartphones”. The results showed that people with low vision who use low vision applications have a higher QoL compared to people with low vision who do not use low vision applications. This result is consistent with the results of studies [18, 19]. In explaining this result, it can be said that since low vision leaves deep effects on various aspects of the sufferers’ lives [7]; in such a way that a person’s education, including reading and writing assignments and learning lessons, social interactions and work life is affected. Therefore, using a tool that can facilitate their daily affairs can affect the QoL of these people [14, 15]. In such a way visually impaired applications can perform a wide range of activities, including the ability to recognize colors, read and write, announce the time and date, intuitive calculator, recognize location, recognize and count money and even recognize emotions from faces. They can simply cover [17, 18]. Therefore, people who cannot use these programs are deprived of a large amount of information that can facilitate learning and various academic, social, and professional advancements.

Also, this research showed no significant difference between the QoL of women and men with low vision. This result is not consistent with the results of research [11]. In explaining this result, it can be said that it seems that the participants in this research experience more crucial

issues that affect their QoL beyond gender. Today, academic, occupational and social problems are common for both sexes (men and women). Just as female visually impaired people have learning problems in learning, reading and writing, it seems that male visually impaired people have experienced the same problems in studying and learning. In addition, nowadays, employment and earnings are not specific to a specific gender and both genders experience similar issues in this field. Therefore, gender cannot be a determining variable in the QoL of the present research sample. In addition, this research showed that the QoL of low vision users and non-users of low-vision applications is not statistically different based on gender. This finding is consistent with the results of research [12]. Although other variables can be effective in this relationship, it seems that gender is not an effective factor in the use of these applications in the present research sample. Various reasons can be mentioned to explain this result; Among other things, the use of this program has grown a lot among different strata of society today. Also, the availability and low price of this tool can be among the reasons for the expansion of the use of this tool among users of both sexes.

Also, this research showed that no significant difference is observed between the life quality of low vision people with different age levels. This result is not consistent with the results of studies [4-6, 15]. It seems that the current research sample has characteristics that can have a greater impact on the QoL of visually impaired people at different age levels. Among these characteristics, we can mention people’s desire to grow, belonging to a certain social class, having social support [16] or other personality variables such as resilience or high awareness of their problem and adapting to it. On the other hand, it seems that today, different people with different tastes and even different age groups use mobile phones, and their phones have other useful functions for them in addition to communication.

Also, this research showed that the life quality of low-vision people users and non-users of low-vision applications is not statistically different based on age. This result is consistent with the results of studies [4-6]. In explaining this result, it can be said that nowadays many communication, educational and self-help programs have become common, whose purpose is to help people in need and make their lives easier. For example, disabled people who were not able to walk independently, with the help of wheelchairs that are becoming more advanced every day, experience moving without the help of others. Therefore, there are tools and programs for visually impaired people in every age group that have made life easier and independent; in such a way that they can do their daily life without the need of others and can even do more complex tasks, such as studying and learning and working alone. Therefore, it can be said that these programs and applications are a useful tool to help visually impaired people of any age.

In addition, this research showed that no significant difference is observed between the QoL of visually impaired people with different educational levels. This result is not consistent with the results of research [10]. In explaining this result, we can refer to the socio-economic level of the research participants; because it seems that this variable can reduce or increase the consequences of low vision and various educations. Therefore, it is possible to explain this result by considering other variables influencing the research results. Also, it is possible that doing the daily tasks of visually impaired people in the present study does not require a very high education and only the ability to read and write, and work with a mobile phone can help these people live better. On the other hand, it is possible that the level of education, except at least that, was not a very decisive variable in the lives of visually impaired people present in the research.

Also, this research showed that the QoL of people with low vision who use and do not use low vision applications is not statistically different based on the level of education. This result is not indirectly aligned with the results of research [10]. As stated about the lack of difference between different levels of education and QoL, it seems that the variable of education, except for at least in the sample of the present study, is not a variable affecting the QoL of visually impaired people who use and do not use applications. Because, even with very low education, users can use these programs for their well-being and managing their daily affairs, without facing any special problem that requires higher education.

In addition, this research showed that visually impaired people and people with moderate visual impairment have a higher QoL compared to weakly impaired people. This result is consistent with the results of research [7]; because according to this research, poor vision can have a significant effect on patients' participation in their favorite activities, social interactions and finally emotional health and as a result, have a destructive effect on people's QoL [7]. Therefore, a determining factor in the QoL of visually impaired people is the severity of this disease. For this reason, people with weak vision experience a lower QoL compared to people with low vision and moderate vision. Because it seems that the greater the severity of this disease, the more it will affect the person's ability to use the environment and adapt to it. On the other hand, it seems that visually impaired and moderately visually impaired people can manage their life affairs more easily by using programs and other methods and use their daily needs without much dependence on others.

Also, this research showed that no significant difference is observed between the users and non-users of the application in weak and moderate visually impaired people, but visually impaired people who use low vision applications are compared to visually impaired people who do not use it and have a higher QoL. This result is consistent with the results of studies [2, 9]. In explaining this result, it can be said that since technology is developing at a stunning speed, visually impaired or even blind people will have a much better life if they are provided with modern facilities [8, 20]. These programs, which are very functionally designed, can make life easier for these people so that they can manage their daily life challenges more easily and thus experience a higher QoL [7, 19]; For example, computer screen reading software, audiobooks, e-books and many other programs that, in addition to facilitating communication and reading and writing, improve the QoL of these people and facilitate their learning [2, 9].

## Conclusion

The results showed that low-vision people who use low-vision applications have a higher QoL compared to people with low-vision who do not use low-vision applications. Also, gender, age and education, except visual acuity, do not have a significant role in the QoL of blind people who use and do not use applications. As a result, considering the impact of applications in facilitating the daily affairs of visually impaired people, it is recommended to use them in treatment and educational programs in hospitals and even in the family.

## Limitations

This research had limitations. We can mention the sample size. Therefore, one should be cautious in generalizing the results of this research. Also, the sample of the present study included certain visually impaired people (people whose best-corrected vision is worse than 20/70). Therefore, this result cannot be generalized to all visually impaired people. This research was conducted in one city and cannot be generalized to other cities and regions. Finally, due to the conditions of the patients and the research time, it was not possible to use other data collection methods such as interviews. It is suggested that in future studies, this research should be done in a larger sample to ensure and generalize its results. The present research should be conducted in a sample that considers the general spectrum of blindness. It is suggested to use other data collection methods, such as observation, interview, etc. in future studies.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of the [Iran University of Medical Sciences](#) (Code: IR.IUMS.REC.1402.785).

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### Authors' contributions

Supervision: Abbas Riazi and Mohammad Kamali; Methodology: Abbas Riazi; Data collection and writing: Sara Imani; Review and editing: Mohammad Kamali; Final approval: Fatemeh Riazi.

### Conflict of interest

The authors declared no conflict of interest.

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## مقاله پژوهشی



# کیفیت زندگی با و بدون استفاده از تلفن هوشمند در بین افراد کم بینا

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## چکیده

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**مقدمه:** کیفیت زندگی نابینایان متأثر از متغیرهای مختلفی از جمله سن، جنس، سطح تحصیلات، شدت کم بینایی، استفاده از اپلیکیشن‌ها و نرم‌افزارها و غیره است. این تحقیق با هدف مقایسه کیفیت زندگی افراد کم بینا که از برنامه‌های کم بینایی در گوشی‌های هوشمند استفاده می‌کنند و استفاده نمی‌کنند، انجام شده است.

**مواد و روش‌ها:** جامعه آماری شامل کلیه بیماران کم بینا مراجعه کننده به مراکز تحقیقاتی کم بینایی و سایر موسسات فعال در زمینه نابینایی و کم بینایی شهر تهران بود. حجم نمونه این پژوهش با استفاده از روش نمونه گیری تصادفی و فرمول کوکران ۴۳ نفر بود که با توجه به نیاز به گروه کنترل ۹۰ نفر در نظر گرفته شد. ابزار گردآوری اطلاعات پرسشنامه کیفیت زندگی حکیم زاده یزدی (۱۳۹۱) بود. برای تجزیه و تحلیل واریانس یک متغیره دو طرفه و نرم افزار SPSS نسخه ۲۱ استفاده شد.

**یافته‌ها:** نتایج نشان داد که افراد کم بینایی که از برنامه‌های کم بینایی استفاده می‌کنند کیفیت زندگی بالاتری نسبت به افراد کم بینایی دارند که از برنامه‌های کم بینایی استفاده نمی‌کنند ( $P < 0/05$ ). همچنین تأثیر متغیرهای جمعیت شناختی بر کیفیت زندگی بیماران کم بینایی با استفاده و عدم استفاده از برنامه‌ها ارائه شد ( $P > 0/05$ ) تأثیر معنی داری نداشت.

**نتیجه گیری:** با توجه به تأثیر کاربردها در تسهیل امور روزمره بیماران کم بینا، استفاده از آن در برنامه‌های درمانی و آموزشی در درمانگاه‌ها و حتی بیمارستان‌ها توصیه می‌شود.

## کلیدواژه‌ها:

کیفیت زندگی، کم بینایی، گوشی هوشمند

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