


Parental Awareness of Smartphone-Based Applications for Visually Impaired and Blind Children in Yogyakarta, Indonesia

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ABSTRACT

Introduction: Smartphone-based applications (SBA) are currently available to help children with visual impairment (VI) and blindness progress to the next level of learning. This study aims to explore parental awareness of SBA to support the learning process of their visually impaired children. **Methods:** A cross-sectional study involving 27 children with VI and blindness. Parents were sent a questionnaire to be completed. The 20-item questionnaire measured the history of their children's general and eye health, and SBA awareness and use, if any. Children were examined for general health and current eye conditions. **Results:** Blindness was 92.9%. The most common cause of blindness was retinopathy of prematurity. The majority went to a special school for the blind. Parents' education level was mostly high school graduates. Only 22.2% parents were aware of the existence of SBA for children with VI and blindness. **Conclusion:** Parental awareness regarding smartphone-based applications (SBA) for children with VI and blindness was low.

Keywords: Blindness, children, low-vision, smartphone-based application.

ABSTRAK

Pendahuluan: Aplikasi berbasis ponsel pintar (ABPP) saat ini tersedia untuk membantu anak-anak dengan gangguan penglihatan dan kebutaan ke tingkat pembelajaran selanjutnya. Tujuan penelitian ini adalah untuk mengetahui kesadaran orang tua mengenai aplikasi tersebut untuk membantu proses pembelajaran anak mereka. **Metode**: Studi potong lintang melibatkan 27 anak dengan gangguan penglihatan dan kebutaan. Para orang tua dari anak tersebut diberi kuesioner berisi 20 pertanyaan meliputi riwayat kesehatan umum dan kesehatan mata anak serta pengetahuan dan penggunaan ABPP untuk menunjang kebutuhan belajar anaknya. Pemeriksaan kesehatan umum dan mata dilakukan untuk mengetahui kondisi terkini. **Hasil:** Jumlah anak dengan kebutaan mencapai 92,9%. Penyebab utama kebutaan adalah retinopati prematuritas. Kebanyakan anak bersekolah di sekolah luar biasa. Pendidikan orang tua didominasi oleh lulusan SMA. Hanya 22,2% orang tua yang mengetahui adanya ABPP untuk anak dengan gangguan penglihatan dan kebutaan. **Simpulan:** Pengetahuan orang tua terhadap adanya ABPP untuk anak dengan gangguan penglihatan dan kebutaan rendah. **Karina Satyani Pratiwi, Adika Zhulhi Arjana, Ayu Yunita Ratnaningrum, Manusama Hasan Sabana, Atien Nur Chamidah. Pengetahuan Orang Tua di Yogyakarta akan Adanya ABPP untuk Anak dengan Gangguan Penglihatan dan Kebutaan.**

Kata Kunci: Kebutaan, anak, gangguan penglihatan, aplikasi berbasis ponsel pintar.

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INTRODUCTION

The global prevalence of blindness among children, using WHO criteria, was 4.5%.[1] The estimated prevalence of blindness or severe visual impairment was 0.23 per 1000 children in Yogyakarta.[2] Muhit, *et al*., 57.9% of the severe visual impairment and blindness, 24.6% had mild to moderate visual impairment among children under the age of 15 who went to a special school.[2] UNICEF reported that 36% of children with all types of disabilities did not attend school.[3] Thus, there is a possibility that the number of children with VI is greater than reported.

Traditional learning involves course materials and teaching techniques designed for children with sight. Children with VI will experience difficulties dealing with traditional learning.[4] Specialized learning methods were established to accommodate these children. A few methods to help these children's learning process include, but are not limited to, the Braille method, audio description, gestures, and touch.[5] Braille methods are widely accepted in special schools for the blind.[6] Children with blindness must rely

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on their tactile perception to read and write with the Braille method.[6,7] Available Braille-based textbooks in Indonesia were reported to be around 2,800 books.[8] This number was considered extremely low compared to books available to normally sighted readers. This lack of Braille-based educational resources has made the learning process for children with blindness lengthy and complicated.[6]

Nguyen *et al*. discovered that reading and staying up to date with technology were among the first priorities for people with low vision.[9] Assistive devices to help visually impaired children study are readily available nowadays. These devices range from low-vision devices (LVDs) to sophisticated screen-reading software programs and refreshable Braille displays for blind users.[10] Joshi, *et al*., reported that the use of this device could boost confidence and performance in daily tasks.[11] However, these devices were costly, particularly in low- and middle-income countries; only 5%–15% of those who needed these devices were able to obtain them.[6,12]

Smartphone-based applications (SBA) for people with VI are developed to help them keep up with technology. Earlier studies showed that using this application may benefit daily activities and studying.[6,13,14] This study aims to identify parental awareness of SBA use to improve their children's learning process.

METHODS

A descriptive cross-sectional study involved children with visual impairment who were members of AKADINI (Asosiasi Keluarga dengan Disabilitas Netra Indonesia), a support group based in Yogyakarta. Researchers first shared information about the study with the AKADINI community, followed by the distribution of an online consent form (Google Forms) for parents to indicate willingness to participate. Total sampling was applied to all eligible children registered in AKADINI. 32 children were initially registered through this form, as well as those who can come in for a physical examination. However, only 27 children attended the study and were included in the final analysis. Five children were excluded due to non-attendance without explanation.

The inclusion criteria were all children with visual impairment or blindness registered in the AKADINI group, whose parents had provided informed consent and who were willing to participate in both the questionnaire and examination. The AKADINI group was selected because it is a support group based in Yogyakarta and the surrounding area, making it easier for parents to bring their children in for physical examinations as part of this study. Exclusion criteria included failure to attend the examination or provide complete questionnaire data.

Parents of participating children completed a 20-item questionnaire developed by researchers involving two experts' judgments in content validity, with a validation score 92.5%. The questionnaire involved demographic information, access to healthcare, history of eye disease, and awareness of smartphone-based applications (SBA) designed to support children with low vision or blindness.

All participating children underwent a general physical examination, including height and weight measurements. Eye examinations performed by an ophthalmologist, including visual acuity assessment (using HOTV letters), anterior segment evaluation, and posterior segment evaluation when media clarity permitted. Fundus photography using the Optomed Aurora IQ was performed in children with clear refractive media. The diagnosis of distant vision impairment was classified using the International Classification of Diseases 11 (2018) as shown in the **Table 1**.[15]

Ethical approval was obtained from the Ethics Committee at the Directorate of Research and Community Service, Universitas Negeri Yogyakarta. Written informed consent was obtained from all parents or guardians prior to participation. Data was analyzed using descriptive statistics with SPSS v. 16.0.

RESULTS

Fifteen girls and twelve boys were included in this study. The youngest child was 3 years old, and the eldest was 18 years old, with a mean age of fifteen girls and twelve boys were included in this study. The youngest child was 3 years old, and the eldest was 18 years old, with a mean age of 9.26 (± 3.99) years **(Table 2)**. **Table 3** showed that most children were in the blindness category.

Table 1. Blindness classification.[15]

Category	Definition
Mild	6/12 – 6/18
Moderate	6/21 – 6/48
Severe	6/48 – 3/60
Blindness	visual acuity worse than 3/60

Table 2. Demographic data of the participants (n = 27).

	Mean	Standard Deviation
Gestational Age (Week)	31.70	± 5.21
Birth Weight (Gram)	1,878.89	±767.65
Age (Year)	9.26	± 3.99
Paternal Age (Year)	41.70	± 9.18
Maternal Age (Year)	38.56	± 8.6

Table 3. Number of children with visual impairment and blindness.

Degree of Visual Impairment	Frequency (n)	Percent (%)
Moderate	1	3.7
Severe	1	3.7
Blindness	25	92.6
Total	27	100

All parents were aware of the cause of their children's VI. Most children were born premature **(Table 4)**. Retinopathy of prematurity (ROP) was the leading cause of blindness, but less than the total number of prematurely born children **(Table 5)**.

Most children went to special schools for the blind. Two children went to a common pre-school as there was no available pre-school for the blind (**Table 6**).

Parental education levels were mostly high school graduates (**Table 7**). **Table 8** showed that only 22.2% of parents were aware of smartphone applications for disability; 2 of them were already using them, and 1 was learning to use them.

DISCUSSION

Education is a basic need for everyone and is supported by law in Indonesia. Children need education to prepare for their future, including children with VI. The groundbreaking Landscape Analysis on Children with Disabilities in Indonesia found that 36% children of all types of disabilities did not attend school.[3] Data showed that roughly 1.5 million people with VI in Indonesia were school-age children.[15] Another estimate indicated that 71,400 children were registered at a special school for the blind.[16] In this study, we found that most of the children went to a special school. Parental support for the education of children with VI is very important. This support will influence children's achievement and interest in learning at school, as well as their confidence level in daily activities.[17]

We discovered that the most common cause of VI in this study was ROP. This finding is in accordance with the leading cause of childhood blindness in the US.[18] These children will develop visual maturation with a pathological retina. Thus, it is important to screen for early intervention possibilities to prevent visual processing dysfunction.[19]

Basic education involves reading, writing, and literacy. Loh reported that children with VI have a generalized lag in reading compared to those with normal sight.[20] Children with blindness must have the ability to read and write Braille to achieve their learning process. Most of the children in this study must rely

Table 4. Number of premature children.

Gestational Age	Frequency (n)	Percent (%)
Premature	21	77.8
Mature	6	22.2
Total	27	100

Table 5. Etiology of blindness.

Cause of Blindness	Frequency (n)	Percent (%)
Retinopathy of Prematurity (ROP)	16	59.3
Microphthalmia	4	14.8
Retinitis Pigmentosa	2	7.4
Peters Anomaly	1	3.7
Deprivation Amblyopia	1	3.7
Optic Atrophy	1	3.7
Phthisis Bulbi	1	3.7
Anophthalmia	1	3.7
Total	27	100

Table 6. Participants' education.

Education Levels	Frequency (n)	Percent (%)
Pre-School	2	7.4
Kindergarten	4	14.8
Elementary School	17	63
Junior High School	2	7.4
High School	2	7.4
Total	27	100

Table 7. Parents' education levels.

Education Level	Father		Mother	
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Elementary School	3	11.1	0	0
Junior High School	2	7.4	3	11.1
High School	12	44.4	12	44.4
Diploma/Graduate	9	33.3	12	44.4
Postgraduate	1	3.7	0	
Total	27	100	27	99,9

Table 8. Parental awareness about SBA for children with VI and blindness.

Parents'* Awareness about SBA for VI	Frequency (n)	Percent (%)
Yes	6	22.2
No	21	77.8
Total	27	100

*either father, mother, or both parents fill out the questionnaire

on Braille at school. However, Braille learning does not come without obstacles. We discovered that parents found Braille learning resources were limited; thus, exposure to reading Braille was limited as well.

Audio learning may also help children with VI to comprehend more, in addition to Braille textbooks.[21] However, textbooks that come with audio description in Indonesian are limited and not available in every province in Indonesia.[22] Kana, *et al*., suggested that reliance on audio learning leads to greater reluctance to learn Braille and greater difficulty with spelling and writing.[23]

Low-vision devices (LVDs) are now widely available as well. Prior studies reported the benefit of LVDs.[10,11] Unfortunately, these devices are costly and are not covered by our National Insurance. In this study, 92.6% children had blindness. This indicates that low-vision device use will not be very useful for these children, as supported by Gyawali, *et al*.[24] In addition, LVD use may come with problems, including non-acceptance by the children, discomfort during use, and discontinuation due to misplacement or damage.[24–26]

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Educational assistance and auxiliary tools are insufficient for children with blindness. Thus, supplementary SBA might be a great solution and widely available. However, only a few parents in this study were aware of the SBA's presence. Among those who were already aware, they installed the SBA, which did not feature Indonesian because no such application was available. Thus, its use was inefficient. This finding is supported by Nahar, *et al*., who finally succeeded in developing such application in the Bangla language.[13]

To our knowledge, this is the first study to report on parental awareness of SBA use among children with VI and blindness in Indonesia. This low rate of parental awareness may provide useful information to improve parental awareness and to develop SBA for VI in Indonesia to supplement children's learning process. The government may plan a budget and policy to improve the learning process for children with VI and blindness.

A limitation of this study was that we did not note which parent completed the questionnaire. Our subject was limited to the AKADINI support group, whose members mostly lived in the suburbs. Future studies should include more subjects to comprehend this limitation.

CONCLUSION

This study found that only 22.2% parents were aware of smartphone-based applications (SBA) designed to support children with VI and blindness. This low level of awareness suggests that many parents may lack information regarding helpful digital tools to support their children's learning. In settings with limited Braille resources, increasing parental awareness and accessibility of SBA could offer an alternative means of educational support.

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PUBLICATION STATEMENT

The researcher has obtained permission from AKADINI (Asosiasi Keluarga dengan Disabilitas Netra Indonesia) to include the institution's name in the scientific publication of the resulting article.

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QUESTIONNAIRE QUESTIONS

No.	*Pertanyaan*	
1.	*Nama lengkap anak*	
2.	*Jenis kelamin anak*	☐ *Laki-laki* ☐ *Perempuan*
3.	*Tanggal lahir*	
4.	*Berat Lahir*	..... gram
5.	*Usia kehamilan*	..... *minggu*
6.	*BB sekarang*	..... kg
7.	*TB sekarang*	..... cm
8.	*Tingkat pendidikan anak*	1. PAUD 2. TK 3. SD 4. SMP 5. SMA
9.	*Nama ayah*	
10.	*Tanggal lahir ayah*	
11.	*Pendidikan terakhir ayah*	1. TK 2. SD 3. SMP 4. SMA/SMK 5. D1/D2 6. D4/S1 7. S2 8. S3
12.	*Pekerjaan ayah*	
13.	*Nama ibu*	
14.	*Tanggal lahir ibu*	
15.	*Pendidikan terakhir ibu*	1. TK 2. SD 3. SMP 4. SMA/SMK 5. D1/D2 6. D4/S1 7. S2 8. S3
16.	*Pekerjaan ibu*	
17.	*Kelainan mata anak yang diderita anak*	1. *Retinopati prematuritas* 2. *Kelainan kornea* 3. *Glaukoma* 4. *Katarak* 5. *Tidak tahu* 6. *Lainnya:* .....
18.	*Apakah orang tua mengetahui adanya aplikasi ponsel pintar yang bisa digunakan untuk membantu aktivitas anak dengan keterbatasan penglihatan?*	1. *Ya* 2. *Tidak*
19.	*Jika ya, aplikasi apa yang digunakan?*	
20.	*Apakah ada akses ke pelayanan kesehatan?*	1. *Ya* 2. *Tidak*

Abbreviations: PAUD: *Pendidikan anak usia dini*; SD: *Sekolah dasar*; SMP: *Sekolah menengah pertama*; SMA: *Sekolah menengah atas*. D: *Diploma*; S: *Sarjana*.

Questionnaire Validation Results

Validator 1. Rendy Roos Handoyo, M.Pd
Validator 2. dr. Kartika Ratna Pertiwi, M.Biomed.Sc., PhD

No	Question	Validator 1	Validator 2	Mean
1.	*Kesesuaian instrumen dengan tujuan pengambilan data.*	5	4	4.5
2.	*Menggunakan bahasa yang sesuai dengan pengetahuan orang tua atau wali anak dengan disabilitas penglihatan.*	5	5	5
3.	*Istilah-istilah yang digunakan mudah dipahami oleh orang tua atau wali anak dengan disabilitas penglihatan.*	5	4	4.5
4.	*Kemudahan penggunaan instrumen orang tua atau wali anak dengan disabilitas penglihatan.*	5	5	5
5.	*Kesinambungan antar instrumen.*	4	4	4
6.	*Kesesuaian jumlah pertanyaan dengan variabel yang diteliti.*	4	4	4
7.	*Pilihan jawaban pada instrumen membantu menghindarkan dari bias ingatan.*	5	5	5
8.	*Kemudahan untuk menetapkan jawaban yang diperoleh melalui masing-masing instrumen kuesioner dan menghasilkan informasi yang relevan bagi peneliti.*	5	5	5
	Total value	38	36	37

Conclusion:
The researchers used the following percentage feasibility measurement technique:

P=f/nx100%
P = Score percentage
f = Total score obtained
n = Maximum total score

Percentage (%)	Qualitative Criteria
86%–100%	Well Worth It
71%–85%	Worthy
56%–70%	Enough
41%–55%	Less
<40%	Failed

The final validation score for the questionnaire was 92.5%, making it highly suitable for use.