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Bynocs

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ABSTRACT:

"Bynocs" is a revolutionary mobile application designed to address lazy eye (amblyopia) treatments through an innovative and user-friendly approach. The app integrates personalized treatment plans with interactive vision therapy exercises, leveraging artificial intelligence algorithms to tailor exercises to individual needs. Bynocs prioritizes user engagement through a visually appealing and easy-to-navigate interface, fostering motivation and commitment to treatment regimens.

With a focus on progress tracking, the app provides users with detailed analytics and visualizations, allowing them to monitor improvements over time. Bynocs also seamlessly integrates with wearable technology, enabling real-time tracking of eye movements and enhancing the app's adaptability. Furthermore, the inclusion of telemedicine support ensures that users can connect with eye care professionals remotely, receiving expert guidance throughout their treatment journey. In summary, Bynocs emerges as a comprehensive and accessible solution for lazy eye treatment, leveraging the power of mobile technology, artificial intelligence, and personalized care to revolutionize vision therapy.

Keywords: Amblyopia. telemedicine

1. INTRODUCTION

Amblyopia, colloquially known as "lazy eye", is a neurodevelopmental disorder of the visual system which causes reduced vision in one or both eyes. Amblyopia (also called lazy eye) is a type of poor vision that usually happens in just 1 eye but less commonly in both eyes [1]. It develops when there's a breakdown in how the brain and the eye work together, and the brain can't recognize the sight from 1 eye [1]. It is usually a result of abnormal visual experiences during the developmental years. With a prevalence of 2% -5%, it is among the leading causes of visual disability in children and adults with residual disease. Amblyopia has traditionally been considered a mono ocular disorder causing a binocular dysfunction. As a result, patching or penalizing the good eye has been the gold standard of treatment for many years. This forces the brain to focus on the image received by the affected eye. But this treatment has its limitations.

The current concept is that Amblyopia is a binocular dysfunction, and it is caused because of the suppression by the ocular dominance columns of the dominant eye over the non-dominant eye at the level of the cerebral cortex [1]. Dichoptic therapy is emerging as a very effective tool in the management of Amblyopia. Here, contrast-adjusted images are presented to the 2 eyes, with the dominant eye getting an image of lesser contrast than the non-dominant eye. This contrast differentiation removes the interocular suppression in the ocular dominance columns and results in a visual gain of the amblyopic eye. Lazy eye treatment software for lazy eye offers treatment for Amblyopia in the form of games [5]. Treatment is based on the principle of Dichoptic therapy, where both the eyes are made to view images with different levels of contrast. The patient is made to play games on a patented software with both the eyes open and wearing special anaglyph glasses [5].

In the world of healthcare, where personalized solutions are key, Bynocs emerges as a fresh perspective on amblyopia treatment. Amblyopia, commonly known as lazy eye, has often been approached with standardized methods [5]. However, Bynocs takes a different route, leveraging smart machine learning techniques to offer a more individualized and effective approach to care. Telemedicine, which enables video or phone appointments between a patient and their health care practitioner, benefits both health and convenience. More health care providers are offering to "see" patients by computer and smartphone [4].

Rather than relying on traditional methods, Bynocs uses algorithms like Factorization Machine and Singular Value Decomposition to delve into each individual's treatment history. It considers factors such as treatment adherence, progress, and responses to tailor a unique plan for each user.

To assess its impact, Bynocs uses standard metrics like classification rate, precision, and recall. Additionally, it introduces a unique scoring system that evaluates a user's commitment to their treatment over a month [5]. This adaptive approach ensures that the treatment plan evolves based on the user's needs and consistency. This highlights 'Bynocs' ability to discern and recommend treatments effectively. In essence, Bynocs represents a shift towards a more

individualized approach to amblyopia treatment. Its use of smart algorithms, personalized plans, and adaptive scoring sets a new tone for healthcare interventions, moving away from a one-size-fits-all mentality. Welcome to a new era in amblyopia care.

Treatment history matters, and Bynocs acknowledges that. It looks at elements like adherence, progress, and responses to various treatments, crafting personalized plans that adapt to the user's needs. No rigid protocols – just a tailored approach that evolves based on your experience. Bynocs is more than an app; it represents a shift towards a more personalized journey in amblyopia care. Smart algorithms, personalized plans, and adaptive scoring redefine the conversation, showcasing the potential for a tailored approach in the realm of healthcare. Welcome to a new perspective on amblyopia treatment – welcome to Bynocs.

ADVANTAGES OF BYNOCS:

• Good compliance as children love to play games -Encouraging children to engage in binocular treatment through games enhances their compliance by making the process enjoyable. The interactive and entertaining nature of games not only maintains the child's interest but also promotes consistent participation, ultimately leading to better treatment outcomes [5].

• Good success rate - The term "good success rate" implies that the binocular treatment has demonstrated effective results in addressing the targeted issues. This indicates that a significant proportion of individuals undergoing this treatment experience positive outcomes, such as improved vision or other intended therapeutic benefits.

• No recurrence.- The absence of recurrence suggests that the binocular treatment provides lasting and sustainable results. This is a crucial advantage as it indicates that the treatment is not only effective in the short term but also prevents the re-emergence of the targeted issues, leading to long-term benefits for the individuals undergoing the treatment.

• Being a binocular treatment develops stereopsis.- The use of binocular treatment contributes to the development of stereopsis, which is the ability to perceive depth and three-dimensional vision. This is essential for various activities, including judging distances and spatial relationships, enhancing overall visual function and perception [5].

• No incidence of Diplopia.- The absence of diplopia (double vision) as a side effect indicates the safety and precision of the binocular treatment. This is crucial for ensuring that individuals undergoing the treatment do not experience discomfort or visual disturbances, contributing to a positive overall treatment experience [5].

• Superior stability. -The term "superior stability" implies that the binocular treatment provides consistent and reliable results over time. This stability is crucial for maintaining the effectiveness of the treatment and ensuring that improvements in vision or other targeted outcomes remain steady, contributing to the overall success of the intervention.

• More consistent response.- The consistency in the response to the binocular treatment suggests that individuals undergoing the intervention exhibit predictable and positive changes. This reliability in the treatment's effects is essential for healthcare professionals, as it allows for better planning and management of patient care, ultimately leading to improved overall treatment outcomes.

2. Literature Survey

Amblyopia, commonly known as "lazy eye," is a neurodevelopmental disorder leading to reduced vision in one or both eyes, often stemming from abnormal visual experiences during developmental years. A child's vision develops in the first few years of life. It is important to diagnose and treat amblyopia as early as possible. Otherwise, a child with amblyopia will not develop normal, healthy vision [2]. Traditionally considered a monocular disorder, treatment involved patching or penalizing the stronger eye to force the brain to focus on the amblyopic eye's image. However, this method has limitations. Emerging concepts suggest that Amblyopia is a binocular dysfunction, originating from suppression by ocular dominance columns in the cerebral cortex. Dichoptic therapy, presenting contrast-adjusted images to both eyes, has gained attention as an effective treatment. This approach aims to eliminate interocular suppression, promoting visual gain in the amblyopic eye.

In the evolving landscape of Amblyopia treatment, Bynocs stands out as a unique app leveraging smart machine learning techniques. Unlike traditional standardized methods, Bynocs takes a personalized approach, offering individualized care for Amblyopia. The app utilizes Dichoptic therapy principles, presenting contrast-adjusted images to both eyes, with the dominant eye receiving lower-contrast images than the non-dominant eye [5]. Bynocs implements its treatment through a patented software where users, equipped with special anaglyph glasses, engage in games [5]. These games, designed based on Dichoptic therapy principles, involve both eyes viewing images with varying levels of contrast. The contrast differentiation aims to break down interocular suppression in ocular dominance columns, leading to visual gain in the amblyopic eye [5].

Bynocs embraces the importance of personalized solutions in healthcare. Through the integration of smart machine learning techniques, the app tailors its treatment approach to the unique needs of each individual with Amblyopia [5]. This shift from standardized methods to a more adaptive and responsive approach marks Bynocs as a fresh perspective in the realm of Amblyopia treatment. Telemedicine refers to the provision of remote clinical services, via real-time two-way communication between the patient and the healthcare provider, using electronic audio and visual means [3].

Furthermore, our literature survey underscores the significance of key features such as contrast-adjusted images, personalized consulting approaches, and machine learning algorithms in the realm of Amblyopia treatment apps, drawing parallels with contemporary trends in medical technology. Recognizing

the need for tailored interventions, Bynocs stands out by incorporating smart machine learning techniques to offer individualized care for Amblyopia, aligning with the broader movement towards personalized learning experiences in the technology landscape.

Moreover, just as comprehensive academic calendars, fee management systems, and result reporting mechanisms are crucial in medical apps for providing centralized and transparent information, Bynocs adopts a similar holistic approach in the realm of Amblyopia treatment. The app integrates contrast-adjusted images for both eyes, utilizing a patented software and special anaglyph glasses in a game-based format. This design not only aligns with contemporary trends in healthcare technology but also exemplifies the commitment to addressing the multifaceted needs of individuals with Amblyopia. The inclusion of emergency contact details and a dedicated page for scholarship information further emphasizes the app's broader welfare and support features, mirroring the comprehensive approach observed in medical apps.

In conclusion, Bynocs, much like a well-designed medical app, showcases a commitment to contemporary trends and best practices in its domain. The integration of Dichoptic therapy principles, contrast-adjusted images, and personalized care using machine learning aligns with the evolving landscape of healthcare technology. By synthesizing these key features, Bynocs contributes to the ongoing advancement of treatment options for Amblyopia, showcasing a commitment to providing effective, personalized, and comprehensive solutions in the field of visual health.

3. Methodology

1. Requirements Analysis:

- Engaged in in-depth discussions with stakeholders, including patients, doctors, service team, to identify and prioritize key requirements and functionalities for the Bynocs app.
- Compiled a comprehensive feature list, incorporating feedback from potential end-users and aligning with the strategic goals of the app in the context of Amblyopia treatment.

2. Technology Selection:

- Chose javascript as the programming language for its concise syntax, expressiveness, and strong interoperability with existing Java codebase.
- Opted for figma as the UI/UX development, leveraging its declarative syntax and seamless integration with the Android ecosystem.
- Selected as the backend solution for real-time data updates, ensuring a dynamic and responsive user experience.

3. Project Planning:

- Developed a detailed project plan outlining timelines, milestones, and individual responsibilities.
- Established an agile development process with defined sprints and iterations, enabling continuous improvement based on stakeholder fee.

4. UI/UX Design:

- Collaborated with UI/UX designers to create wireframes and prototypes, ensuring a user-centric design by incorporating feedback from potential users and adhering to modern design principles.
- Integrated the Bynocs symbol into the theme for brand identity and a personalized touch.

5. Development:

- Implemented logical components using Kotlin, emphasizing modularity, code readability, and scalability.
- Utilized Jetpack Compose to create a sleek and modern user interface, focusing on simplicity and ease of navigation.
- Integrated Firebase for real-time data updates, enabling efficient implementation of Dichoptic therapy principles and immediate result storage.

6. Testing:

- Conducted thorough unit testing for individual components to ensure functionality and reliability.
- Executed integration testing to verify seamless interaction between different modules.
- Facilitated user acceptance testing (UAT) involving potential end-users to validate the app against initial requirements.

7. Deployment:

- Released the app to a limited user group for beta testing, collecting feedback for refinement.
- Addressed identified issues iteratively, aiming for continuous improvement based on user responses.
- Deployed the finalized version to the broader Amblyopia patient community, ensuring a smooth transition from existing treatment methods.

8. Data Security and Compliance:

- Implemented robust security measures to safeguard sensitive patient information.
- Ensured compliance with healthcare data protection regulations by incorporating features such as secure authentication and data encryption.

9. Training and Onboarding:

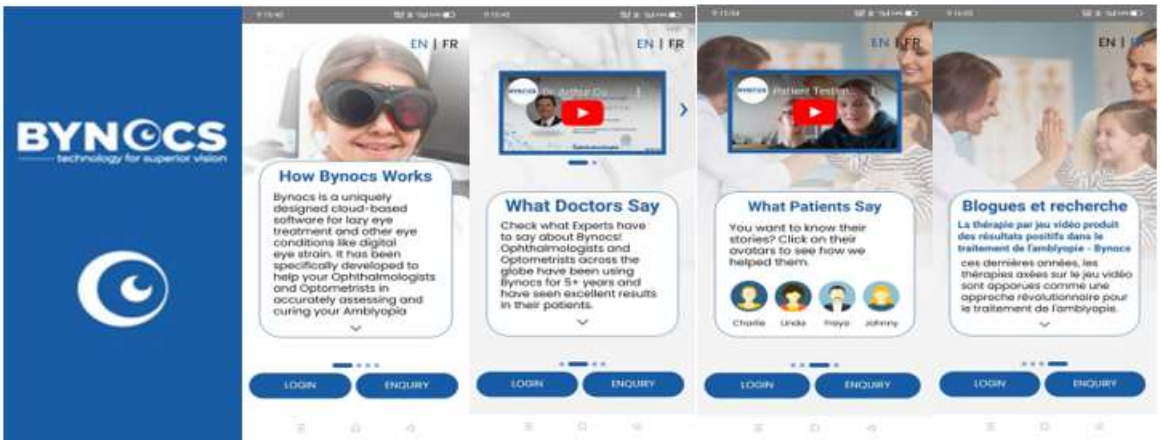
- Implemented robust security measures to safeguard sensitive patient information.
- Ensured compliance with healthcare data protection regulations by incorporating features such as secure authentication and data encryption.
- Conducted comprehensive training sessions for healthcare professionals, ensuring effective usage of the Bynocs app.
- Provided extensive documentation and tutorials for ongoing support.

10. Monitoring and Maintenance:

- Implemented monitoring tools to track app performance, detect issues, and ensure continuous improvement.
- Established a proactive maintenance plan for regular updates, bug fixes, and the addition of new features based on evolving healthcare needs in Amblyopia treatment.

4. Results:

Some of the pages in the app: **Content Pages**

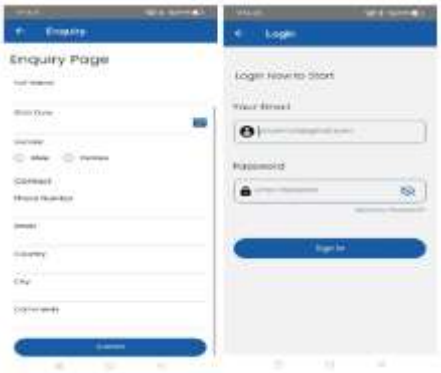


1.About Bynocs.

2. Testimonials from doctor and patients.

3. Abstract of different articles with option to view the full document.

4. All the above four screens are multilingual with English And French By default it is English the forth picture is the example of how it looks in French.

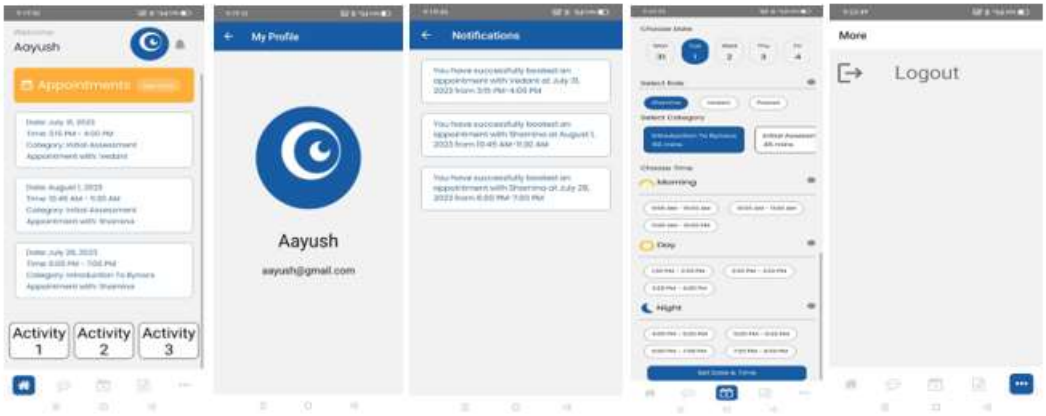


1.In login page, the user has to enter its valid email and password. The password is encrypted and then checked from the API.

2. After successful login, as per the roles defined in the API of that respective email entered, different home page will appear.

3. In enquiry page, the user has to enter its credentials and enquiry details. These credentials are stored in API.

Patient Login



1.The Home Page will show the list of booked appointments with service team. There will be 3 ophthalmology related exclusive activities only for patients. In Home Page, notification icon will appear at top right corner of the page. The notifications for booked appointments will be there. Profile page will also be there where user can view its details and even add profile picture too.

2.In Book appointments page, based on the selected date, service team name selected and time duration the timeslots are calculated using start and end time which is allocated by service team.

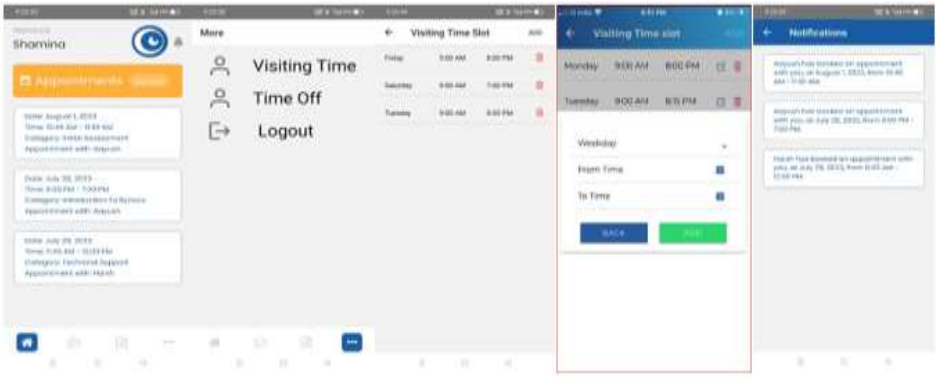
Activities for Patient

Doctor Login

1.The Home Page will show the list of booked appointments with service team. In Home Page, notification icon will appear at top right corner of the page. The notifications for booked appointments will be there. Profile page will also be there where user can view its details and even add profile picture too.

2.In Book appointments page, based on the selected date, service team name selected and time duration the timeslots are calculated using start and end time which is allocated by service team.

Service team Login



The Home Page will show the list of booked appointments with patient/doctor. In Home Page, notification icon will appear at top right corner of the page. The notifications for booked appointments with patient/doctor will be there. Profile page will also be there where user can view its details and even add profile picture too.

1.In More page, there will be three options, Visiting Time, Time-off period and Logout.

2.In Visiting Time page, the service team will assign its time for the day and based on this time the appointments can be booked.

5. Conclusion

In summary, the creation and deployment of our telemedicine application signify a significant step forward in modernizing and improving the overall medical experience for both patients and doctors. The carefully planned approach, guided by thorough requirements analysis and input from stakeholders, has resulted in a comprehensive and user-focused solution.

The selection of technologies, such as Javascript for logical operations, React Native for an intuitive user interface and experience, for real-time data updates, demonstrates a commitment to utilizing cutting-edge tools to streamline health processes. The emphasis on an elegant design, incorporating the Bynocs emblem, adds a personal touch and aligns the app with contemporary design principles. Throughout the development process, user feedback played a crucial role, from the initial gathering of requirements to beta testing. This iterative approach ensured that the app not only met but surpassed the expectations of its users, creating a positive and immersive experience. The inclusion of features such as time off, appointments, and visiting time highlights the comprehensive nature of the app, addressing a variety of needs.

The successful deployment of the app, coupled with robust testing, security measures, and compliance considerations, instills confidence in its reliability and usability. The ongoing commitment to monitoring, maintenance, and adaptation to evolving needs ensures the app's sustainability and relevance in the dynamic healthcare landscape.

As the Bynocs app takes its place as a central hub for information, communication, and resource access, it stands as a testament to the intersection of modern technology and medical advancement. This project not only addresses immediate administrative needs but sets the stage for future innovations in leveraging technology to foster a more efficient, connected, and enriched medical environment.

References

1. National Eye Institute (.gov) -Amblyopia (Lazy Eye) - National Eye Institute
2. American Academy of Ophthalmology - Amblyopia: What Is Lazy Eye?
3. News-Medical - What is Telemedicine? By Dr. Liji Thomas, MD
4. Johns Hopkins Medicine - Benefits of Telemedicine
5. Bynocs: Amblyopia Lazy Eye Treatment
6. American Academy of Ophthalmology. (2017). Amblyopia PPP — 2017.
7. Repka, M. X., & Holmes, J. M. (2019). Pediatric Eye Disease Investigator Group.
8. Holmes, J. M., Lazar, E. L., Melia, B. M., et al. (2019). Pediatric Eye Disease Investigator Group.
9. Webber, A. L., Wood, J. M., Gole, G. A., & Brown, B. (2008). The Effect of Amblyopia on Fine Motor Skills in Children
10. Holmes, J. M., Beck, R. W., Kraker, R. T., et al. (2003). Pediatric Eye Disease Investigator Group.
11. Stewart, C. E., Moseley, M. J., Fielder, A. R., et al. (2004). Refractive adaptation in amblyopia: quantification of effect and implications for practice.