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ABSTRACT

Objective: This paper present to explore the users' insights that contribute to behavior change in blood pressure and the user requirements for a self-care application and analysis for someone with high blood pressure or low blood pressure, which are also known as hypertension and hypotension, respectively. **Methods/Statistical Analysis:** We distributed a survey questionnaire to the public, which is made by Google Forms and getting a total of 60 respondents. The response collected for analyzing through statistical analysis. The questionnaire is then filtered to remove trolls from the report. We phone-interviewed a doctor from Hospital Sultanah Aminah, Johor Bahru. We did an open-ended interview to stimulate the discussion. We also identify the user needs, design a user interface prototype and evaluate using heuristic evaluation. Finally, we conclude the user satisfaction by benchmarking our blood pressure monitor with BPJ and BPID. **Findings:** Results indicated that hypertension and hypotension could be prevented through proper lifestyle changes, if and only if the person is willing to change his/her behavior. The participants well accepted the idea of a self-care application and the components to be included in the self-monitoring application were identified. The SBMP grant the users to view the blood pressure stage by letting the user take their measurement. The evaluation results show the SMBP applications have excellent features in usability heuristic compared to BPID and BPJ. SBMP also surpass design from both BPID and BPJ in term of GUI. SBMP has more features and components that are easier for users compared to BPID and BPJ. The participants well accepted the idea of a self-care application and the components to be included in the self-monitoring application were inserted and implemented.

Keywords: – self-monitoring blood pressure, monitor blood pressure, analysis, GUI, blood pressure, heuristic evaluation

INTRODUCTION

Hypertension is the leading agent of mortality and disability-adjusted life-years worldwide [18, 19]. Hypertension and hypotension are a perilous long-term health condition, especially popular among older adults. If neglected untreated, this disease could lead to heightened cardiovascular mortality and morbidity to individuals, in results, increased consumption of health care. Hypertension is calculated to strike 43 to 56 million adults or 24% to 31% of the US population and is appearing as a vital health predicament in some countries [20, 23-24]. According to the NCBI website [1], it is estimated that the global prevalence of hypertension in 2000 was 26 percent in the adult population. It is expected that the pervasiveness will be increased by up to 29% by 2025. Hypertension is one of the roots of cardiovascular disease and mortality. It is also a vital modifiable agent for coronary artery disease, stroke, and congestive heart failure. According to Alberto Zanchetti in 'hypertension-related mortality and morbidity', Zanchetti found that different parts of the world point out to altered blood pressure thresholds and targets in scanty which may be caused by the weakened efforts towards better control of blood pressure even from the high-risk patient[10]. Hypertension is prevalent, but guideline suggestions for hypertension have been questionable, are of rising concern, and have severe impacts [11]. Hypertension is a global public health concern and is heavily associated with chronic diseases such as myocardial infarction, stroke, heart failure, and renal failure. It approximated that 6% of deaths worldwide are due to high blood pressure (hypertension) [21, 22].

Health mediations using mobile technology are frequently used to accommodate patients and users with the required item to measure blood pressure. According to Tisler in his BP Measurement Journal, it appears to be that the patient has a higher level of acceptance toward the tele-management system. This shows that users need to communicate and rely on real-world communication [14]. These applications also expanded with additional tools and resources to help the users and the health professional to manage and monitor the diseases. HTN reported that a majority of apps are designed to tune BP, weight, or body mass index and concluded that increased overlooking is wanted in medical app development, especially apps qualifying as medical devices [3,4-6]. It is recommended to choose a blood pressure monitor that can be incorporated and flexible to be used in someone's daily lives [16].

However, they did now not habit a formal distinction of the first-class and usefulness of the BP tracking functionalities, for example, whether handy apps enable tracking of domestic model measurements every morning and night over a 7-day duration with the computation of intending blood pressure except the first day readings for medical reservation making as recommended by experts.

With the innovating and progression of technology, mobile apps can track or record the user's monitor blood pressure, diabetes, asthma and much more. Article [2] stated that it would be easier for patients to get acumen into their blood pressure ornaments. However, the article also stated that there is some constraint of self-blood pressure monitors such as availability, the feature of mobile apps and the quality of the mobile apps measuring blood pressure. Currently, there is no regular outline for a self-blood pressure monitoring which is capable of attaching the user to their doctor and give a more in-depth insight into the patients/ users. As such, there is no quality and precise measurement and monitoring of how the apps going to monitor the user's blood pressure.

The current famous blood pressure monitor in the play store, BP Log, and BP Journal are lacking analysis and charts that are easy to understand for the users. Self-Monitor Blood Pressure (SMBP) enables the user to know which their blood pressure classifications. An application that can advise the blood pressure that is recommended by the American Heart Association to help the healthcare provider determine whether treatments are working. Home blood pressure monitor is useful fundamentally for anyone that is diagnosed with blood pressure related quandaries, working adults and pregnant women. A record of readings taken over time affords a "time-lapse" photo of your blood strain that can help you partner with your doctor to make sure that your treatments to lower excessive blood strain (HBP or hypertension) are accomplishing [7].

Many people nowadays are not aware of their blood pressure and it also related to how they're practicing with their lifestyle and that the biggest problem of why people died suddenly. Dr. Clara Chow, a member of PHRI and an associate professor of medicine at Sydney University and the George Institute explained that their study indicates over half of people with hypertension are unaware of their condition in the news. And, amongst those identified, very few are taking enough treatment to control their blood pressure [8]. The Journal of the American Medical Association also found only 46.5 percent of those with high blood pressure were aware of their condition.

Just 32.5 percent of patients who were aware of the fact that they had high blood pressure were effectively keeping their condition under control, and the rest about 21 percent did not become conscious of their blood pressure. They also did not desire to practice a healthy lifestyle. Referring to user requirements, around nine respondents admit that they are either hypertension or hypotension patient and it's almost half of the respondents, 43.3 percent had checked their blood pressure a year ago. It shows that many people are not aware of their health, even though they are aware that they consistently do not follow a healthy diet. Also, 47 out of 60 respondents admit that their family has experienced either hypertension or hypotension, which means the probability for them to get that disease is high.

However, the SMBP can make people aware of their blood pressure because it can set the alarm to remind them and make people alert to check their blood pressure. Nowadays it is convenient because everyone has a cell phone, by having SBPM people can easily save their data into it and also can monitor from statistics to show how the flow of their blood pressure. Furthermore, this self-monitoring blood pressure (SMBP) different and easy than all of the other apps because this app can save users' data through voice recognition; the user only tells the results of their blood pressure test to be stored in the application. The app will acknowledge the command from the users via Guided Command to save the result of the user's blood pressure. The user also can take pictures of the readings, and the application will recognize it and store it in the app by using a specific algorithm. At the same time, the user also can fill their data manual if they do not want to use through voice recognition and take a picture. It's up to users to use the way they are comfortable.

In the following section, we summarily outline our original prototype. This follows with a review of relevant work on automatic blood pressure monitor. A redesign of the original prototype then describes, followed by details of a user study to test the prototype. This prototype in this study was developed to offer users extra features such as give the users to have more acumen about their blood pressure, which is considered beneficial since they will have more awareness and consciousness about their health. Additionally, SBPM has cost-benefits since the users can undeviatingly talk to their respective doctors

without the need to go to a clinic or hospital. SMBP would save them money and time. SBPM also would have a specialty to inform the user about their symptoms about the disease that is associated with hypertension and hypotension, respectively. This feature used technologies that could tell the current health condition and what is going to happen to them by taking their blood pressure measurement and calculate by using a specific algorithm.

METHODOLOGY

IDENTIFYING USER NEED

A web-based survey had been carried out by us in order to identify user needs. The surveys involved two main groups which are knowledgeable users and unknowledgeable users about blood pressure. The age of the users is not a concern in this survey. The survey is being distributed via social media. We have collected 60 feedback within two weeks. These participants consist of various age groups, genders, and ethnicities, whether suffering or not from hypertension or hypotension.

USER INTERFACE PROTOTYPE DESIGN

In the process of designing the prototype, we decided to choose the medium fidelity. We decided to use proto.io as a platform to create the prototype. The heuristic list from (Nielsen, 1994) is used for the evaluation process of our SMBP mobile application with additional guidelines from the Gestalt Principle of Design.

EVALUATION

According to Nielsen & Molich (1990); Nielsen (1995), to identify the usability problems of a user interface design, some of the inspection methods must be applied, and one of them is heuristic evaluation. After some modification by Nielsen (1994) towards the heuristic evaluation method, there exists 10 usability heuristics for the heuristic evaluation which are (i) visibility of system status, (ii) match between system and the real world, (iii) user control and freedom, (iv) consistency and standards; (v) error prevention, (vi) recognition rather than recall, (vii) flexibility and efficiency of use, (viii) aesthetic and minimalist design, (ix) help users recognize, diagnose, and recover from errors, and (x) help and documentation. Taking these ten usability heuristics as a guideline, we evaluate the usability of our application which is SMBP.

We are choosing (1) BP Journal – Blood Pressure Diary (BPJ), and (2) Blood Pressure: Info Diary (BPID) as the two blood pressure mobile application to be compared with SMBP. These two were chosen based on our previous heuristic evaluation of blood pressure application.

The next method we are using for the evaluation of blood pressure mobile application is benchmarking. From Elmuti & Kathawala (1997) there are four types of benchmarking, and the one we choose to be applied is competitive benchmarking as we are comparing SMBP with two other blood pressure mobile applications. This method is needed to find some of the applications that already existed to have vied with our application which is SMBP.

After we conduct a heuristic evaluation among the three mobile applications, which are SMBP, BPJ and BPID, then, we play the role of observers to observe our Self Monitor Blood Pressure mobile app. After evaluators run the tasks and score the severity, we state and describe the problems they faced, and provide their support. Furthermore, we also provide a rating to show how well this app can provide users with information and impact. Below are some of the ratings provided to evaluate each heuristic.

0 = Not a usability problem

1 = Cosmetic problem only: No need fixing unless extra time is available during the project

2 = Minor usability problem: Low priority fixing

3 = Major usability problem: Essential to fix, given a high priority

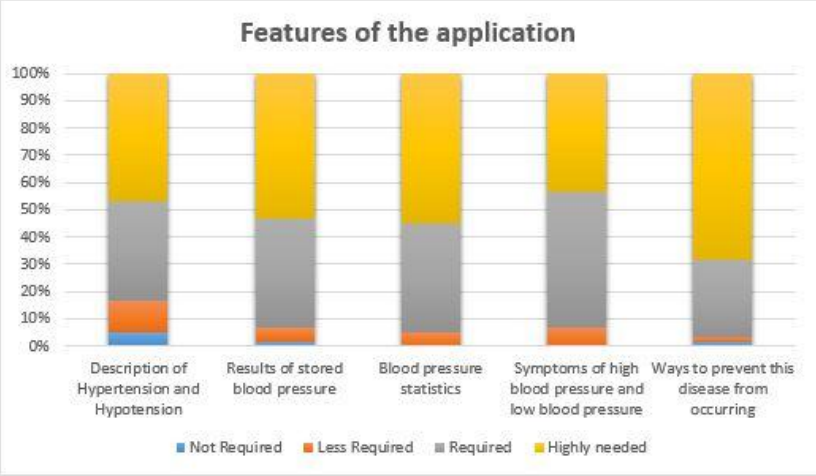
4 = Worst usability: Essential to fix this before the product can be delivered, given the highest priority

NIELSEN'S SET OF HEURISTICS

H-1	Visibility of system status
H-2	Match between system & real world
H-3	User control & freedom
H-4	Consistency & standards
H-5	Error prevention
H-6	Recognition rather than recall

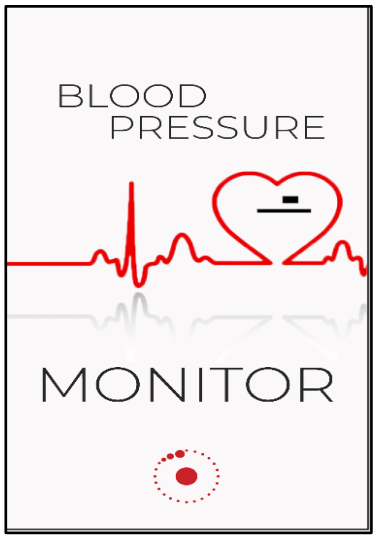
H-7	Flexibility and efficiency of use
H-8	Aesthetic and minimalist design
H-9	Help users recognize, diagnose & recover from errors
H-10	Help and documentation

RESULT - EVALUATION OF THE BP MOBILE APPLICATION

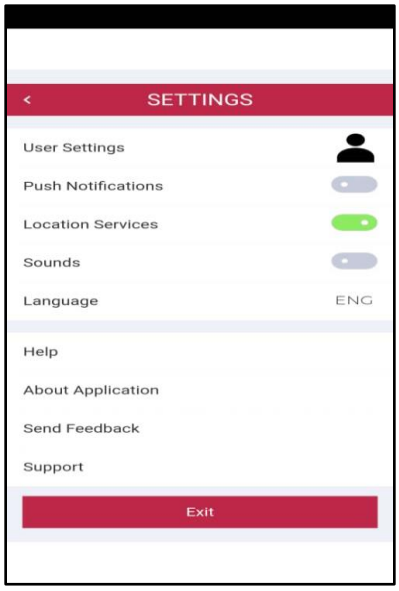


Formula Percentage of public views on the features of the applications.

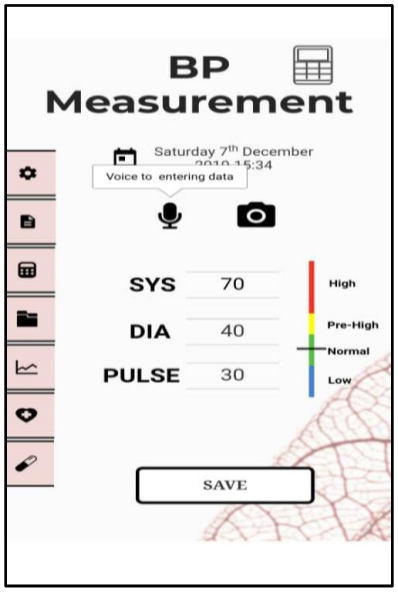
Result from identifying user needs, 46.67% of feedback stated the needs of a description of hypertension and hypotension in the application. As for the importance of the result of stored blood pressure, 53.3% want this feature to be included as well. Plus, 55% of the respondents also want the application to include blood pressure statistics as one of its features. Finally, we noticed that symptoms of high and low blood pressure and ways to prevent high or low blood pressure from occurring are the next required features by them by having 50% and 68.3% choosing highly in need from the survey, respectively.



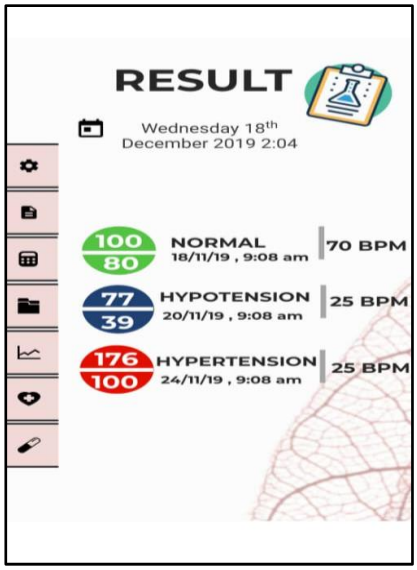
This is a front page of Blood Pressure Monitor. The picture of wave and heartbeat shows that this mobile app has to do with our health. The user who first time using this SMBP also can understand what mean with the wave and also the heart.



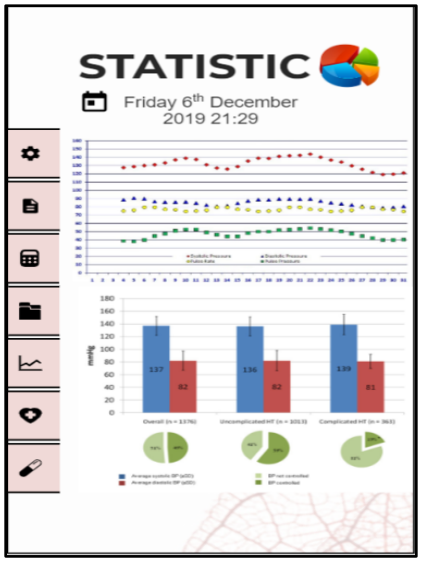
The important part in this mobile app is Settings which is the user can edit important refer to what they want such user profile, the language that they want, and also at Help section user can use it if there is something wrong with their application and they can contact admin to check the error. The user also can check about the application at About Application section.



The second important part of this mobile app is the Measurement section which is where the user can insert their data through it. What is makes the Blood Pressure Monitor mobile app special is it have three-way to insert data. The first way, user can insert by a manual which is they can scroll the number and then after they insert the number, the user can save it by touch Save button. The second way is the user can insert the reading of their blood pressure using a capture picture. After they log in and then in BP Measurement section have to click at the camera icon and they can take a picture from the blood pressure monitor machine. The last way is the user can insert using voice recognition and all three ways can simplify the affairs of consumers whether young or old.



The next section is Result which is the user can check or monitor the blood pressure that they save earlier. This section shows the information about their blood pressure reading and also the date and time that they save it before. This mobile app also tells the user that is where their blood pressure reading level is so that consumers can stay alert and take care of their health.



For Statistic section, it shows that the flow of the user's blood pressure. Users can monitor their flow of blood pressure from time to time whether their blood pressure level is poor or good. In this section, the user can completely monitor it and it shows everything for the user.

The last part of this Blood Pressure Monitor mobile app is the Prevention section. This section shows the user the right way to prevent high blood pressure or low blood pressure. It also gives the link that the user can watch the video and it also has the right way to maintain nutrition

VISIBILITY OF SYSTEM STATUS

Nielsen (1994) proposes that the system has to regularly notify customers and receive general remarks from the order inside a reasonable time. BPJ, SMBP, and BPID provide common features. For example, users can update their blood stress measurements always. (Refer to Fig.1 (a) , Fig.1(b) and Fig1(c)). They could constantly update their blood pressure analysis so that they could measure and take the precaution of all the potentiality that would possibly give infliction to them. Whereas, SMBP provides greater assistance to navigate between all the features provided in it. SMPB has extra features that will let them get the recommended dietary intake so that the user could take care of their food and sugar intake. (Refer to Fig.1 (d)) Furthermore, SMBP apps will load up a welcome display with login for first-time users. This feature lets users traverse and give more understanding to the customers earlier when they utilize this app (Refer to Fig.1(e)).

Figure1(a)

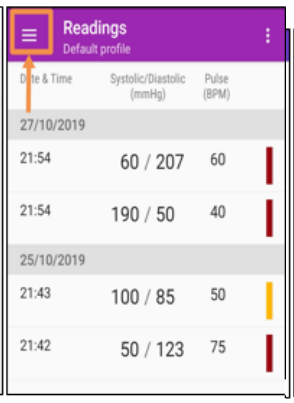


Figure1(b)

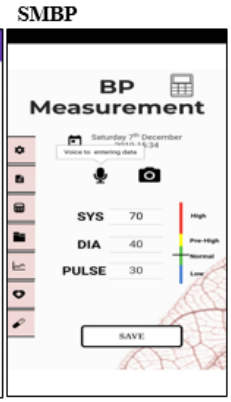


Figure1(c)

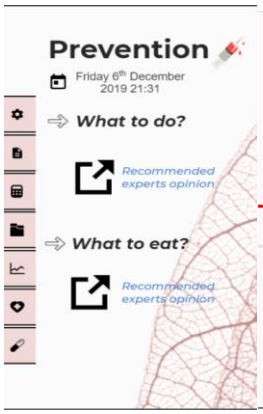


Figure 1(d)

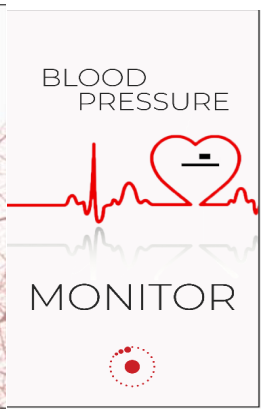


Figure 1(e)

MATCH BETWEEN SYSTEM AND THE REAL WORLD

Rather than utilizing framework situated terms, Nielsen (1994) proposed that a structure should use the language and ideas of its users and keep specific guidelines and a coherent request. SMBP does very well when applying the client language in the framework. It utilizes basic expressions that users know, for example, "result" means the history of readings, "statistic" alludes to the statistics given by the previous blood pressure measurement. “Description” provides the information of both high and low blood pressure, while “symptoms” and “prevention” give information about what could be the cause of it and a direct link to the expert talks about the prevention of the blood pressure problems respectively. The data of the BPID and BPJ versatile pages aren't exactly as easy to understand as the SMBP. For instance, the BPJ does not have limits to set for the pulse where a maximum heart rate is about 220 minus his/her age, which may make clients misconstrue that the elements can't be acquired.

Conversely, the versatile sites of SMBP and BPID organized all the more consistently. For instance, BPJ gives the option to view many types of charts. BPID allows the user to view the stats and graphs in a line chart while SMBP provide all the necessary information at one time and use all the space efficiently. (See Fig. 2)

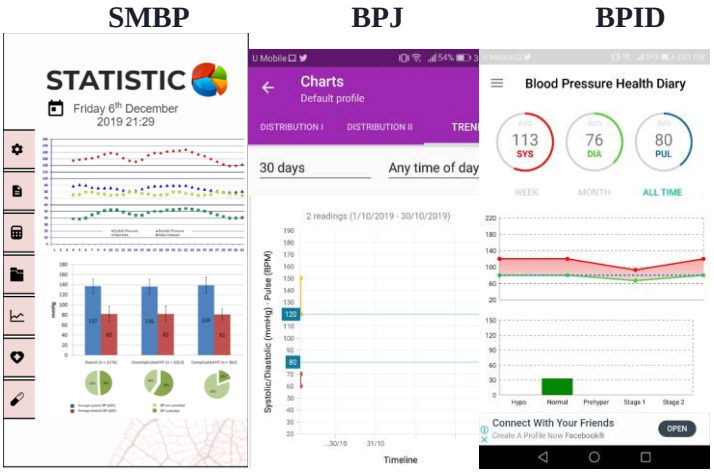


Figure. 2

USER CONTROL AND FREEDOM

Users may accidentally select the system function. Nielsen (1994) suggested that systems ought to give an "emergency exit" for users to leave, just as help users to fix and undo/redo commands. All three applications: BPJ, BPID and SMBP offers conventional design As an example, BPJ and BPID apps have "Option (Three lines icon")"/ "Home Icon" and "Back" catches at the top, which enables users to return to the past page or the designated page if they need to leave an undesirable page (see Fig. 3(a)). Unfortunately, the feature only able the user to get back into the main menu rather than the menu that they opened before opening that particular menu. SMBP has a feature that enables the user to control the navigation in every menu that is shown as the button of navigation is provided on the left of the screen. Another feature is that when the user holds the icon on the left, it will show what screen will be shown if they tap on it (see Fig. 3(b)). In order to exit the apps, user either needs to press “back” button on their mobile or it can be done by the “exit” feature on the setting menu (see Fig3(c)).

BPID **BPJ**

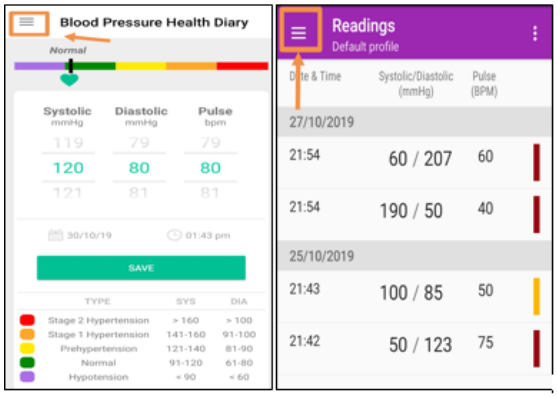


Figure 3

SMBP

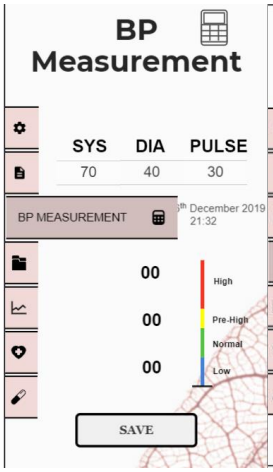


Figure. 3(a)

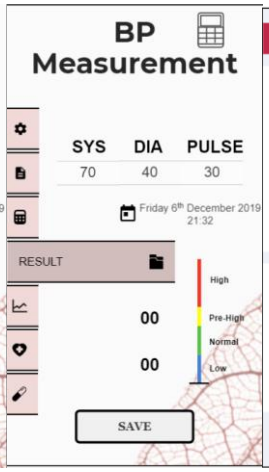


Figure. 3(b)

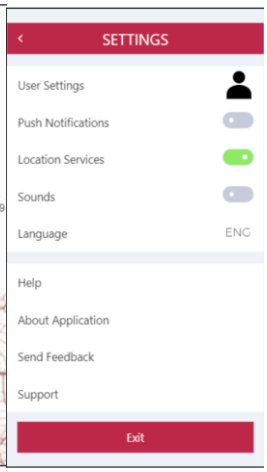


Figure.3 (c)

CONSISTENCY AND STANDARDS

Nielsen (1994) recommended that the substance of the framework ought to implement similarly. To a certain extent, the SMBP mobile app can deliver good content. For example, the SMBP mobile app can help to solve problems such as help, about the application and also language. SMBP provide some the language for user to use but not for BPJ and BPID mobile app. The title for every menu is clear. (Refer to Fig 4 (a)). Furthermore, the SMBP mobile app also has a good interface and design in entering the data. SMBP has three ways to input the data, first using the voice recognition, second use capturing the image and lastly is using the scrolling wheel (Refer to Fig 4(b))**.** BPID mobile app has one way to input data use scrolling wheel and different for BPJ it makes users enter manually. On the other side, it will take much more time for the user to enter the data.

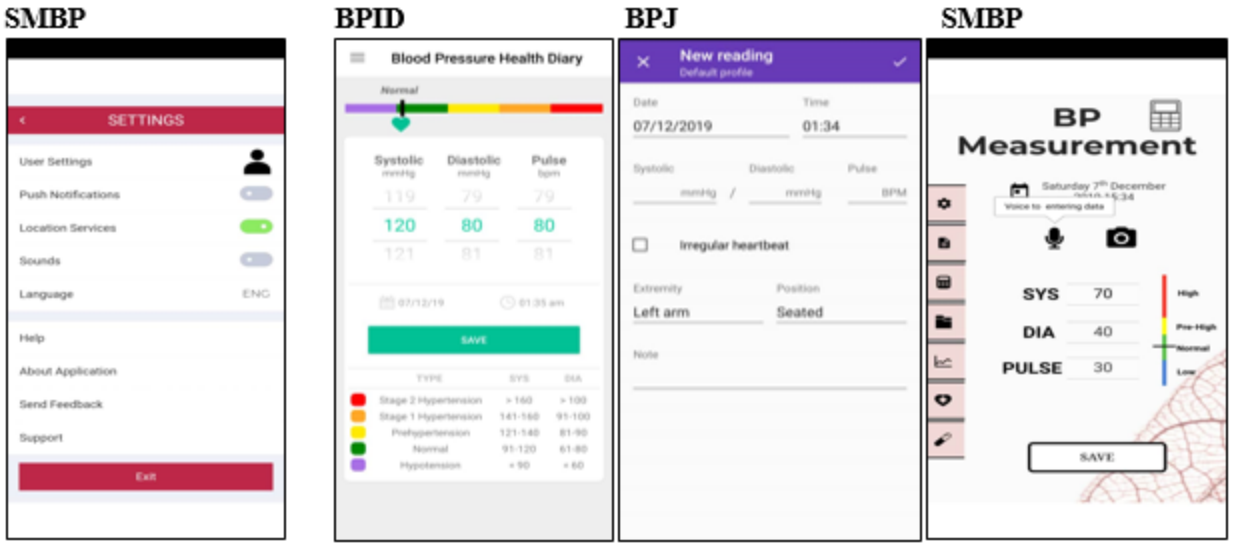


Figure 4 (a) Figure 4 (b)

ERROR PREVENTION

According to Nielsen (1994), systems should have careful design in order to prevent problems. For SMBP it has some similarity with BPJ (BP Journal) a mobile app which is it facilitates the user to see the intent and explanation for hypertension and hypotension. For SBPM, in the Description and Symptom section, the user can just touch the sentence and it will show the description about it (Refer to Fig 5(a)). For example, in the Description section; user touches the sentence of "High Blood Pressure" and then the description about high blood pressure will show on the dialog box and it different from BPJ because of BPJ mobile app it makes user complicated to find it. For the first time, the user will difficult to find where the description at. Users must have to touch the triple line on the top left, then they have to click "Help & Feedback" to find the description of it (Refer to Fig 5(b)). It makes the user hard to find and takes a long time to use it especially for the elderly. While for the BPID (Blood Pressure: Info Diary) mobile app not provide the description neither for high blood pressure nor low blood pressure.

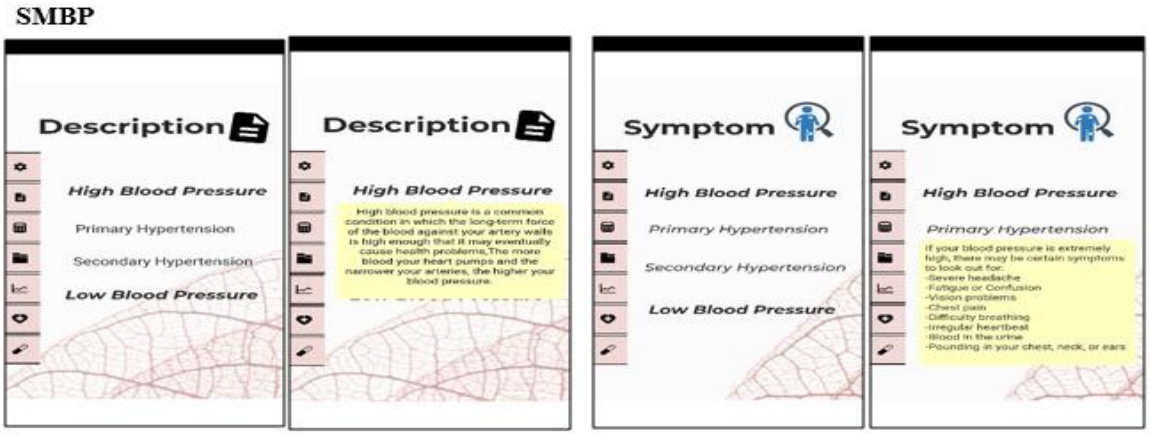


Figure 5 (a)

BPJ

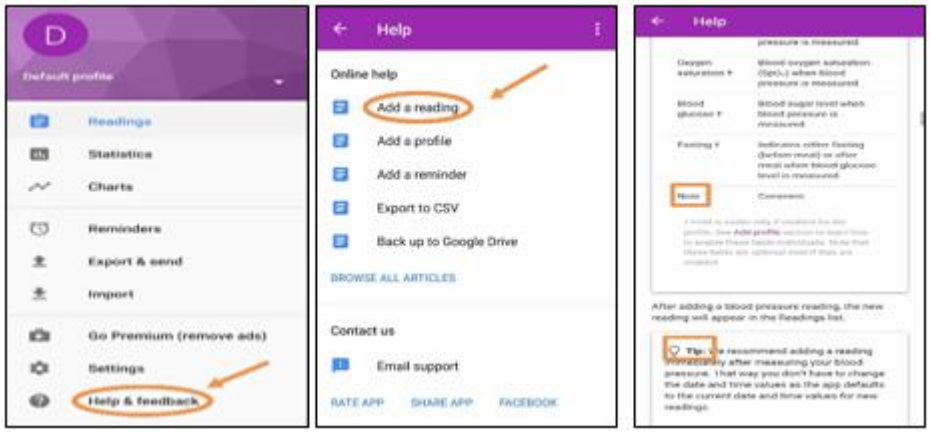


Figure 5(b)

RECOGNITION RATHER THAN RECALL

According to Nielsen (1994), systems should make objects, options, and instructions clear and visible so that users need not remember unnecessary information. The mobile app of the SMBP does quite well in this part. In detail, on each page SMBP mobile app is provided a button on the left-hand side. It makes it easy for the user to go to the page that they want. Differently from BPJ and BPID mobile app because they have to slide to go to another page (Refer to Fig 6(a)). Besides that in SMBP mobile app in part of the Prevention section, it quite interesting and reduce the boredom of user because they can watch the video about the prevention (Refer to Fig 6(b)). Moreover, the SMBP icon for the button is clear and easy to understand. For example, the icon of the BP Measurement is clear enough and the user knows that icon is for adding or enter data about their blood pressure (Refer to Fig 6(c)). The mobile app of SMBP also has a different color stage of blood pressure such as ‘’red for stage 2 hypertension’’ and ‘’blue color for hypotension’’ (Refer to Fig 6(d)). So the user can quickly know which stage they are and it shows that all three mobile apps have clear instructions for users easy to use.

BPID **BPJ**

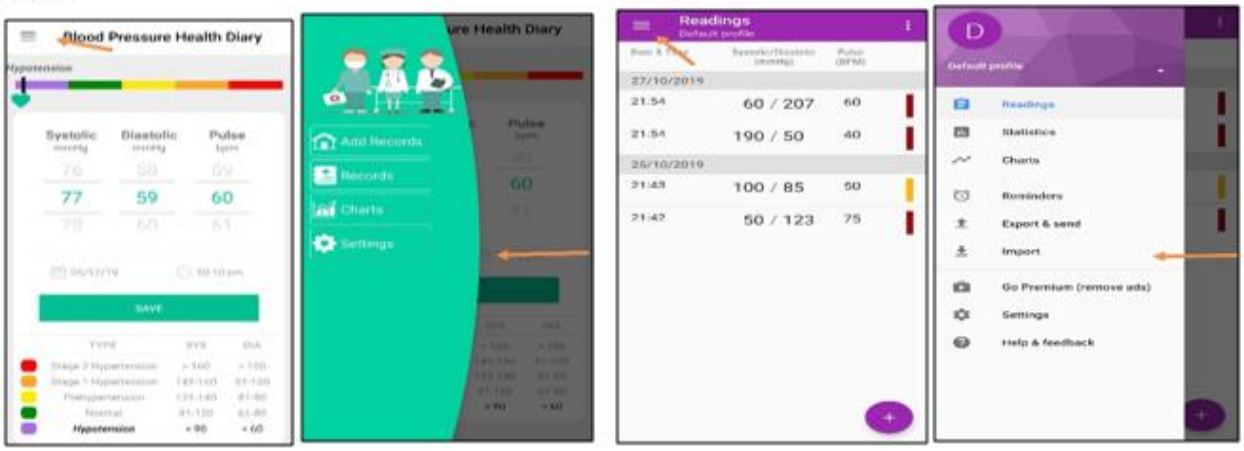


Figure 6(a)

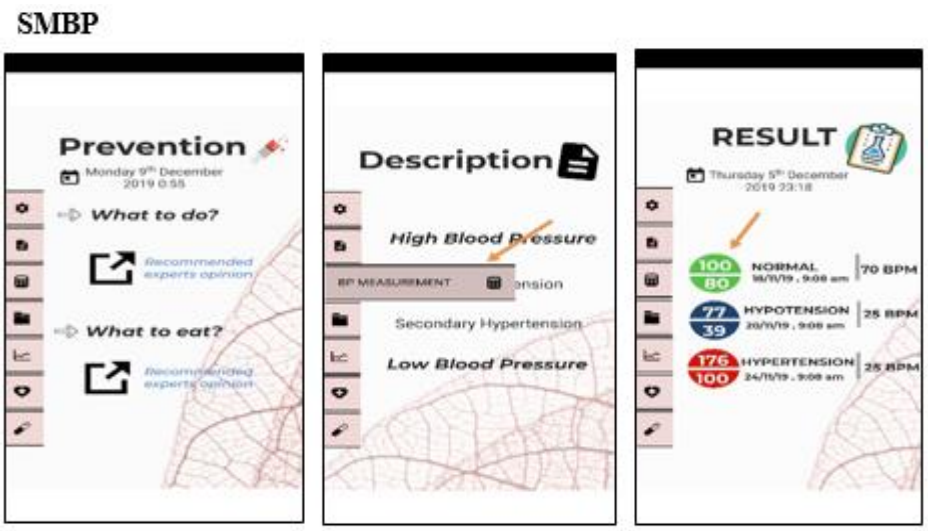


Figure 6 (c) Figure 6 (c) Figure 6 (d)

FLEXIBILITY AND EFFICIENCY OF US

Nielsen (1995) suggested that systems should provide adequate services for both experts and inexperienced users with tailored options. Flexible and efficiency it highly needed in every app because it makes the user feel that the app is user-friendly and easy to handle. In this case, SMBP, BPID, and BPJ have their own flexibility. SMBP mobile app allows users to go to any page without taking a long time. When the user is using this app, users already know and can study it with one view. In other words, the user just needs to touch the button on the left side and then it will show them to the page that they want. Why the menu button is placed on the left and it shows directly? In particular, the SMBP mobile app did not use a hamburger menu [9] because it is more difficult than the usual button. On the other way, the Hamburger menu may look good because it saves space but on the other side it difficult for the user to understand the function of the menu and makes users wonder. For example, in BPID and BPJ mobile app using this kind of menu and users' eyes will look for other functionality for this application (Refer to Fig 7(a)). The menu button in the SMBP mobile app makes it easy for users to quickly capture and understand what this app has to show. By using the icon, the user is also easy to understand; besides that user also can touch the icon and it will also show the meaning for the icon. (Refer to Fig 7(b)).

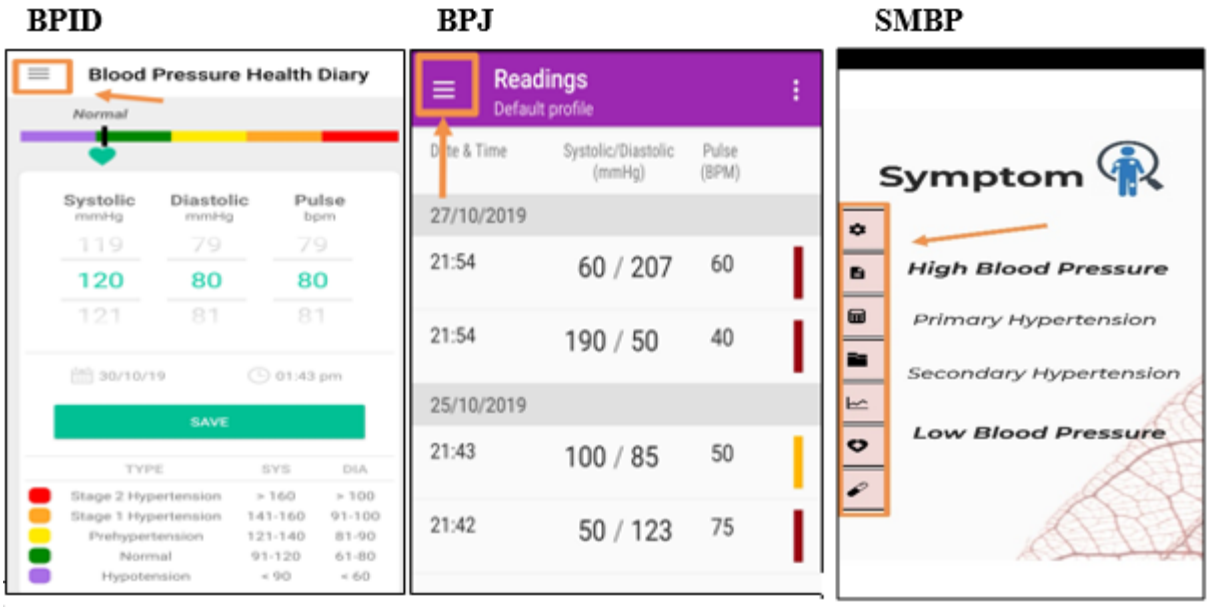


Figure 7 (a) Figure 7(b)

AESTHETIC AND MINIMALIST DESIGN

For this part, SMBP is good at keeping the system aware of some irrelevant information that may confuse the user on how to use it and the same goes for BPID and BPJ. The use of simple wording being used by BPID and BPJ while the use of the simple symbol for representing the menu for SMBP. These features simply following the Nielsen (1994) guidance where it is important to make sure the effectiveness of the information in the system and avoidance of excessive information that may obstruct the user's understanding (Refer to Fig 8).

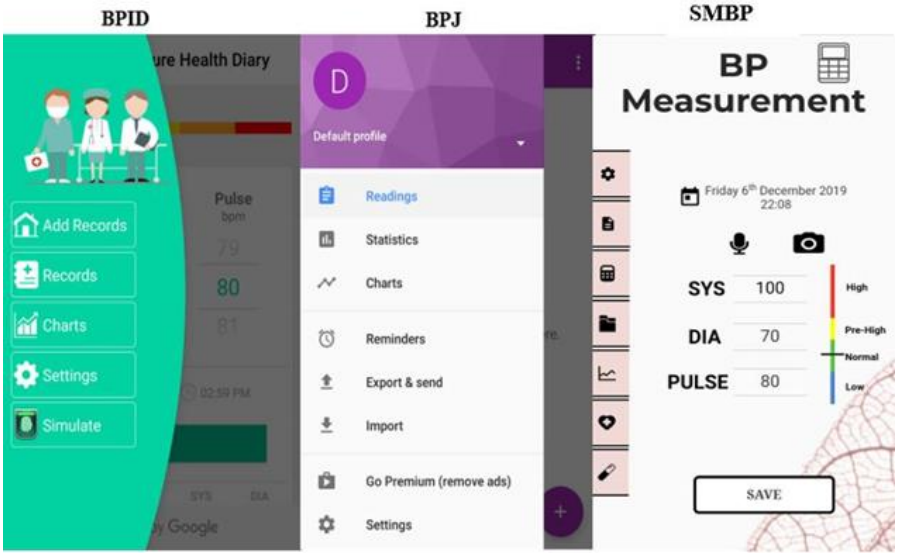


Figure 8

HELP USERS RECOGNIZE, DIAGNOSE, AND RECOVER FROM ERROR

With the guidance from Nielsen (1994) which state that an error message where can easily be understood by the user must exist in the system. All of the three applications meet the requirement where the system is providing an error message to the user. But, only SMBP and BPID fulfills this heuristic requirement due to the understandable error message for the user. Plus, the understandable error message from this two application (SMBP and BPID) can help the user to notice the root of the problem and easily recover from the error meanwhile BPJ include some line of programming language which hardly to be understood by the user (Refer to Fig 9).

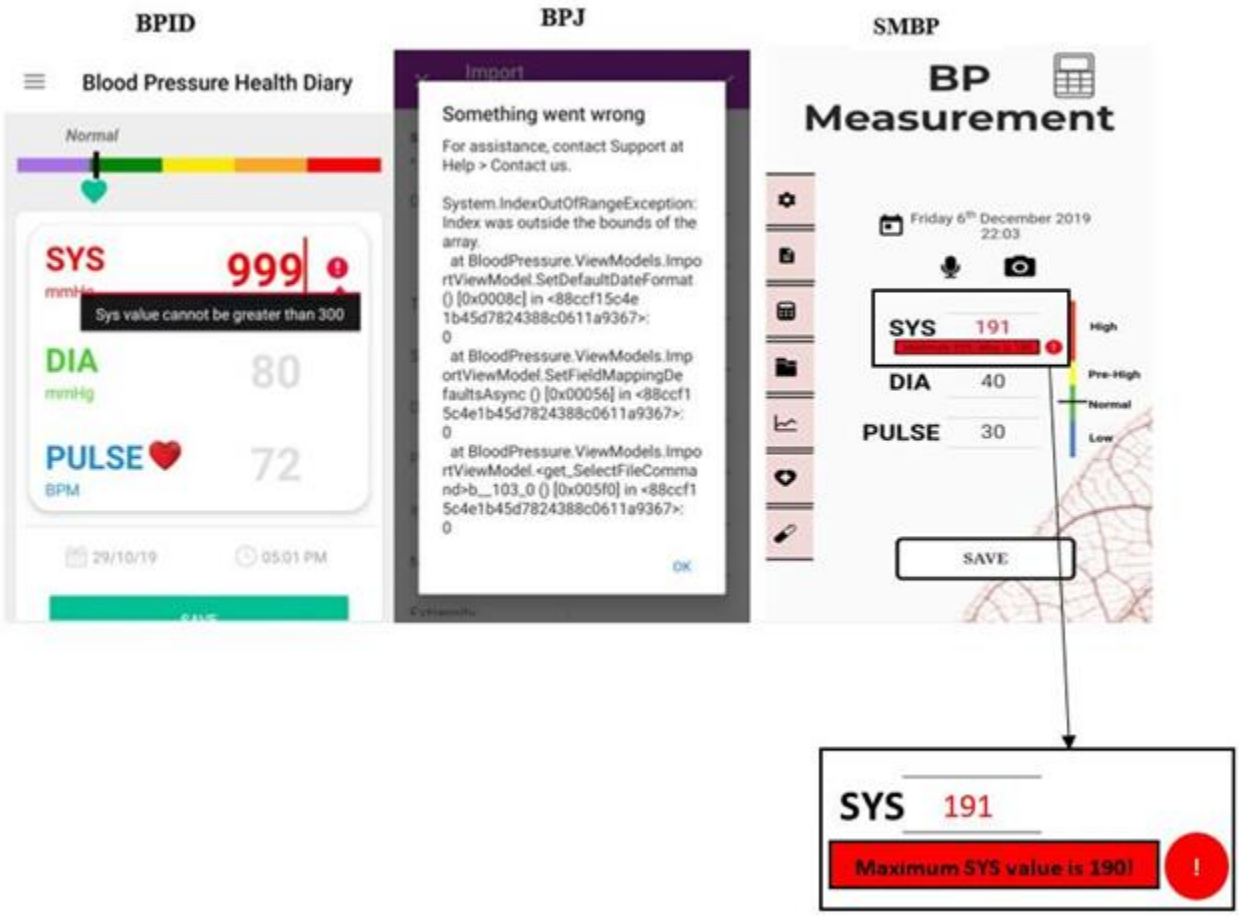


Figure 9

HELP AND DOCUMENTATION

In order to make the user understand most of the application features, it is important to include the help menu in the system. Plus, Nielsen (1994) already stated that assistance toward the user that can be searched easily, and focused on the user's inquiry or task must be included in the system. For BPID, the way of documentation from the system is not very efficient because the user needs to scroll and read one by one of the articles until the user found the information the user wanted. As for the BPJ, it makes a systematic arrangement of articles to make it easier to understand what type of information the user needed. As for SMBP, the system provided some of the information that may be helpful for the user to get some

help regarding the user issues with the application, to know the application information, to send some feedback or to interact with the support system provided in the application. All in all, SMBP and BPJ are the applications that meet most of the requirements of this heuristic (Refer to Fig 10).

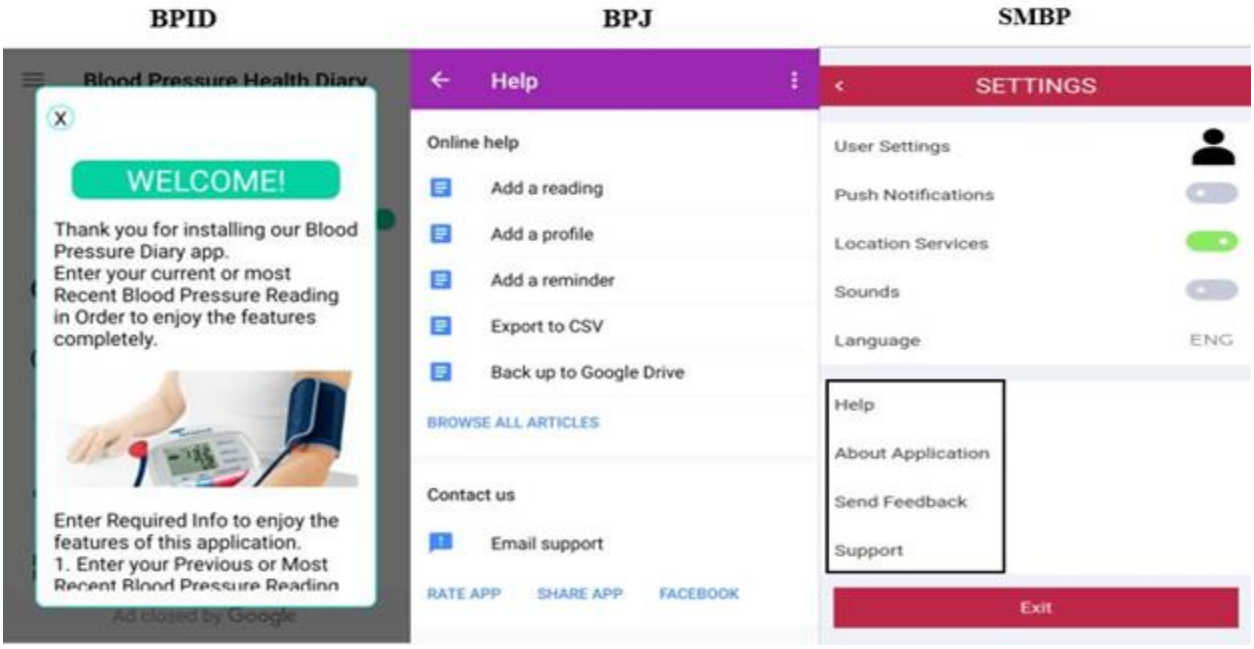


Figure 10

SEVERITY RATING

Nielsen's Heuristics	*BPID*	*BPJ*	*SMBP*
Visibility of system status	• Can update data input • Load welcome screen	• Can update data input • Load welcome screen • Has "Go premium" feature	• Can update data input • Load welcome screen • Result screen are based on user input in measurement screen • Notification is available
Match between system and the real world	• Applying client language in the framework • Lack of versatile page • Has limit to set pulse	• Applying client language in the framework • Has versatile page • No limit to set pulse	• Applying client language in the framework • Has versatile page • Use simple wording • Has limit to user input in measurement • Icon based on real world apparatus according to the screen • Language can be changed according to user
User control and freedom	• Offers conventional design	• Offers conventional design	• Offers conventional design • Exit option available • Easy to go between screen
Consistency and standards	• Lacks of steady substance format	• Deliver steady substance format	• Deliver steady substance format • Titles of the screens are according to their features
Error prevention	• Lacks of error prevention	• Lacks of error prevention	• Has error when user input more than logical measurement
Recognition rather than recall	• Instruction easy to understand	• Instruction easy to understand	• Instruction easy to understand
Flexibility and efficiency of use	• Does not offer advanced searching for expert users.	• Does not offer advanced searching for expert users.	• Provide both interaction of inexperienced and experienced user • System can be adapted
Aesthetic and minimalist design	• Produces a simple design with relevant information	• Produces a simple design with relevant information	• Produces a simple design with relevant information
Help users recognize, diagnose & recover from errors	• Message and solution provided in the system is straightforward to understand and fix the problem	• Error message and solution which is very hard to understand by user	• Message and solution provided in the system is straightforward to understand and fix the problem
Help and documentation	• Contact information availambe • Providing only small amount of article	• Contact information is available • No service provided to help user	• Contact information is not available • Procide help and support option for user • Has feedback option for the user to report any bugs

Table 1

Nielsen Heuristics	Severity Ratings		
	BPID	BPJ	SMBP
H1	2	1	2
H2	1	1	0
H3	2	1	0
H4	1	1	0
H5	1	1	0
H6	0	0	0
H7	1	1	0
H8	0	0	0
H9	0	3	0
H10	1	2	0

Table 2

Based on both table 1 and table 2, we can conclude that SMBP have features that follow Neilsel Heuristics Evaluation. For the H-1, SMBP has a load welcome screen that shows what the apps is about and the object of this apps which is blood pressure monitoring. User also can update the data input and the result screen will display the output of what the user key in. when the result is available, notification will be given. But, there is interface problem for the menu whereas the user needs to hold the menu icon to display the screen name. In contrast to that, user only need to tap to change between the screen which is convenient and saving a lot of time. Thus, the severity ratings for H-1 is given 2 because it only involves the interface problems and is a minor problem whereas it has low priority of fixing. For H-2 until H-10 is given severity rating 0 because SMBP follows the Neilsen set of Heuristics.

DISCUSSION

SMBP mobile application has an excellent interface and design in entering the data. It has three ways to input the data, first using voice recognition, second use capturing the image and finally is by using the scrolling wheel. For voice recognition, we found that precise words need to be taken to let the apps to read what has been said by the user. A better way of executing voice recognition is every section of the data input must be separated. For example, the “systolic” part must be first then the user will choose for the next data input “diastolic” and say the number followed by “pulse”. Next, for the captured image, data input can only be stored as an image and cannot be transferred into data for the apps. However, it is possible to do so, but it needed a sophisticated and complicated coding, time and money to develop such advance application that may require A.I helps. The last data input, scrolling wheel is much more efficient to be used since it does not require much effort into inserting the data input and the user only needs to scroll the numbers on the “systolic”, ”diastolic” and “pulse” data input. The navigation button can be accessed by the user in a much efficient way since every menu has it except for “settings” since the list uses a back button

rather than a quick access menu. The welcome display has a friendly vibe of an application that will help the user on monitoring the blood pressure and does not sophisticated with a lot of any random pictures or information. The display is elegant and straightforward. There is a part where an expert of blood pressure needs to refer which is the “prevention”. In contrast, when the user taps the arrow button, it will directly into the video of an expert talking about the prevention of high and low blood pressure. The problem faced by the user can be delivered in the “Settings” menu with the option “Help”. Also, if they want to change the language, it can be done in the “setting”. For the info about both high and low blood pressure is being made plain and simple in a letterbox and does not require unnecessary action to access it. The color of the navigation icon is being made into a dull color rather than a colorful one to avoid any confusion so that color blinded users can use it freely.

CONCLUSION

In conclusion, the results show that Self-Blood Pressure Monitor mobile app has the potential to motivate people to be aware of their blood pressure. Heuristic evaluation and benchmarking methods are used to evaluate the usability of the blood pressure monitoring applications. However, participants feel satisfied with the flow of the SMBP mobile app, and it is easy to handle it. All tasks have been accomplished and were concluded in the report. The report using heuristics evaluations and benchmarking methods are used to evaluate the usability of the blood pressure monitoring applications. The evaluation result shows the SMBP applications have good traits in usability heuristics compared to BPID and BPJ. There is still much room for improvement. In the future, we would like to implement all design implications for our evaluation into a new system. The voice recognition and image capture are one of the examples that can improve by implementing complex coding and A.I into the system.

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