

Application for Evaluation of Nervous System Recognition and Commands

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Abstract. *The purpose of this research is to develop and design the application for assessing the nervous system recognition and commands of human under abnormal conditions. There were 80 sample examiners both males and females under this research examinations. They were selected using purposive sampling. The selection was used by the application on Android operating system in smartphone and tested the time gained from using application before and after drinking alcoholic beverage. The responsive recognition and commands test time results for males and females before drinking alcoholic beverage were 22.70 and 25.18 milliseconds in average, respectively; while after drinking alcoholic beverage for males and females were 32.22 and 35.11 milliseconds, respectively. The application accuracy by 100-time testing was 95.25 %.*

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1. Introduction

Responding to the stimulants surrounding us plays an important factor in human's everyday life activities. Some certain activities do rely on the process of visualization and giving response such as riding on a motorcycle where the commuters (riders) needs to have good frontal vision in order to control the vehicle. Whenever the traffic lights are on or the road signs are present, they do immediately affect the decision-making process; same thing goes to the subsequent action of pressing brakes whenever the red lights are visible. The spontaneous reaction by commuters can reduce the amount of accidents taking place on the road [1]. Physical fitness test is capable of determining the completion and capacity of our bodies' physical health [2] through measuring the reaction performed against the outside stimulants, the perception and awareness of outside stimulants made by our nervous system, and how well-

functioned our nervous system gives direct command to other organs in response to the arousing factors. The measurement of reactions can be determined in the form of specific time result with the deployment of time measuring equipment whereas the person taking the test is the one pressing the start and stop button. The test can also be achieved by the standardized equipment through the same method of measuring time for giving back reaction [3].

From the previous research, there has been a designation and invention of time measuring equipment/kit for testing the movement reaction as well as the equipment used for stimulating or expediting the reaction with high-definition results, including hearing and feeling. Having stated that, the time measuring machine for testing reaction is still highly costly in the market and is not suitable for portable quality [4]. Not long after, there has been a development of testing system for our physical reaction which is also in the portable and mobile form as we know well today as a "smart phone". It relies on the receptors, acceleration, and sound in processing the final result. The problem found with a smart phone is the receptors using sound where it is highly sensitive and may result in the final result's error for there are a lot of outside disturbing noises in the ambience [5]. There was also the development of system which keeps recommendation for doing exercise through smart phone with android based operating system, which keeps advice and the team determine the final result how many values required. However, the application of a smart phone is too complicated for the user to fill up the needed database. For the first time user of this my phone, they may find it too complicated to access the application for participating in exercise program [6].

In the present time, technology has been devilled up so rapidly that a smart phone is one of the equipment bitches that is improved and enhanced with so many functions for doing a number of activities compared to the past. The smart phone can bring a lot of convenience to our everyday life in so many aspects such as communication or traveling to the destination by the use of application named Google maps. The popularity of smart phone therefore rises instantaneously across the big-city society in a very short span of time [7]. The smart phone, therefore, play a

substantially important role in living today’s lives and a lot of developments by implying technology to smart phone can increase the capability and functionality of the phone. In some models, smart phones can be used with comparison to small computer which is portable (i.e. laptops) and providing so much convenience for users. There has also been a development of functioning system which there are numerous patterns to choose from nowadays for users to make their own selection [6]. However, there is no presence of smart phone which is capable of measuring the reception and monitoring of the nervous system, especially prior to and after the consumption of alcoholic beverage.

This research article is thus presented in order to study the designing process of new application development on a smart phone with an android-based operating system for the process of evaluating responsiveness and command parts of human’s nervous system. The comparison is drawn between reception and command parts as functioned by our nerve system. The same comparison is also made between samples

Groups of males and females, before and after the consumption of alcoholic beverage and the correlation between the amount of alcohol rates that was consumed and the nervous system’s effectiveness in terms of giving responsiveness and command through the application for the purpose of determining the nervous system’s functionality but randomly showing visuals of green lights, yellow lights and brake lights in as an arbitrary order. For example, seeing red lights leads to the responsiveness, which is coupled with the order by the nervous system, results in pressing the on screen button to pause the smart phone’s running time; the amount of time taken for the completion of the process to determine the effectiveness the recognition and commanding orders of each individual. This same approach can also be applied for the testing of readiness and the running of everyday-life activities of each individual such as riding my motorcycle, driving a car through different traffic lights on the road. In such instance, any delay in reaction to stimulants by the nervous system’s responsiveness and commanding will ultimately affect the immediate stop of the car which, as a consequence, can result in accidents taking place to the commuters from riding such vehicle.

2. Experiment and Methodology

2.1 Population and sample

1. Population in this research was staff and students in E-SARN Technological College, Udonthani province, Thailand.

2. The sample group in this research was 80 persons; including of 40 males and 40 females. They were selected by using the purposive sampling by Krejcie and Morgan sampling table (Krejcie and Morgan, 1970: 607- 610).

2.2 The system design and development

The application that was designed for nervous system assessment was by using a smart phone with the Android operating system; having operation as shown in Fig. 1. The data was received from the designed program (having algorithm as shown in Fig. 2) in the smart phone from the tester. The system sent the readable value to the processing program to check the time spent in the test for the testers whether the nervous system readiness is available or not. The operation of the application utilizes the internal processing of a smart phone to measure the time of the touch screen and to press the stop button. When the testers saw a red signal and reacted by pressing the stop button to stop the time, the system will send the touch screen response value to the designed program in the smart phone to process the relevant calculations. These data would be then used to evaluate the nervous system in order to compare the time spent by each particular testing person.

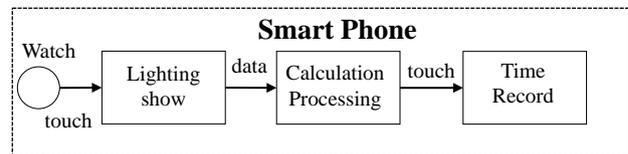


Fig. 1: Operation of the designed test system

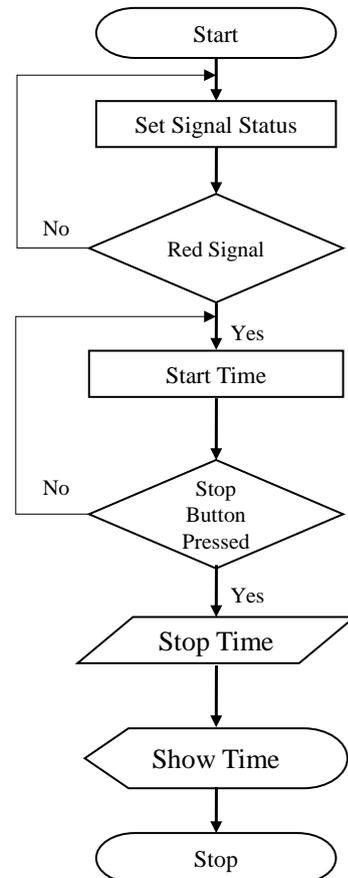


Fig. 2: Flowchart diagram of the functions of the application for the nervous system evaluation in a smart phone

From Fig. 2, the functions of the application for nervous system evaluation are as follows:

1. Start the program
2. Receive value from the touch screen to stop the time
3. Calculate the value to find the stop timing
4. Check the using time
 - 4.1 If not, go back and get a new time value
 - 4.2 If yes, pass the value to continue the program
5. Bring the time value to show on screen
6. Finish

2.2.1 Application design and development

The design and development of the system in order to receive the data and control the function of the nervous system evaluation application are as follows:

1) Start page: as shown in Fig. 3; where the particular numbers are referred to:

- No. 1: Time spent for the test
- No. 2: Start button and stop button
- No. 3: Red signal channel
- No. 4: Yellow signal channel
- No. 5: Green signal channel
- No. 6: Time reset button

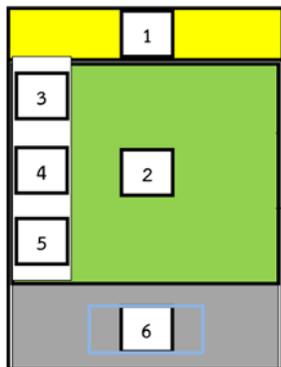


Fig. 3: Design and development of the displaying screen for the test

2) Icon of the application named “ENSRAC”

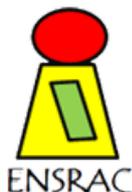


Fig. 4: Icon of the application under this research

2.2.2. Functions of the proposed application

1) Main menu screen of the proposed application for the nervous system evaluation on the Android operating system of the smart phone, as shown in Fig. 5.



Fig. 5: Main menu screen for the proposed application

2) Testing screen after the tester presses the green button to start the program, as shown in Fig. 6.

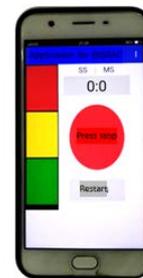


Fig. 6: The screen for the proposed application

3) The screen while testing the Nervous system, the tester has to press the button when the red signal stop still appears, as shown in Fig. 7.



Fig. 7: The screen while testing the proposed application

4) Screen showing test results of the Nervous system evaluation shows in Fig. 8.



Fig. 8: Screen showing test results of the proposed application

2.3 Functional testing

In the testing of application for the nervous system evaluation using the Android operating system on a smart phone, when the tester sees the random red signal and then the signal stops, but the time will continue to show so the testers must press the stop button immediately. After that the system will process and show the time from the testers. From creating the application for the nervous system evaluation, the system was used with the testers after it was already accurate.

Fig. 9 shows the testing procedure for the test under this research. There were 80 staff and students (40 males and 40 females) from the E-SARN Technological College, Udon Thani province, Thailand joined this research; where they were chosen to be the sample groups in the nervous system evaluation tests. Each person was tested by 5 times and the average value of the data was used for the analysis which were done before and after drinking the alcoholic beverage. Then, the data were recorded and analyzed.

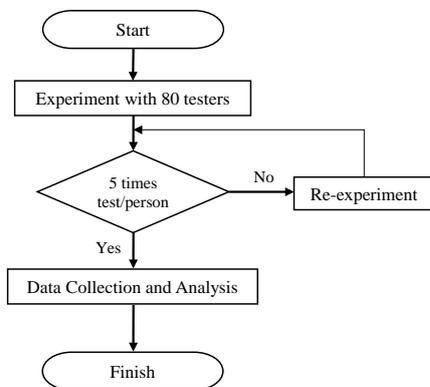


Fig. 9: Testing procedure for this research

3. Experimental Results

The comparative result of the nervous system's response and commands between males and females, before and after consuming the alcoholic beverage, through the application for processing the evaluation of the nervous system's response and commands on a smart phone with android operating system. Some photographs of the test activities were shown in Figs. 10-12.



Fig. 10: photographs of testing activities BEFORE the testers consumed the alcoholic beverage



Fig. 11: photographs of testing activities DURING the testers consumed the alcoholic beverage



Fig. 12: photographs of testing activities AFTER the testers consumed the alcoholic beverage

Figs. 13-15 show the analysis results according to the tests and Tables 1-2 show the summary of the analysis information.

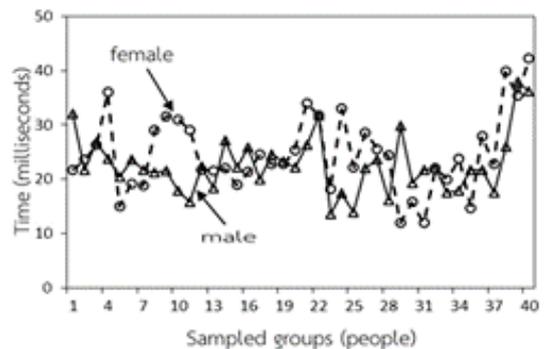


Fig. 13: Measured time spent BEFORE alcoholic beverage consumption from the alcohol measuring machine between male and female testers

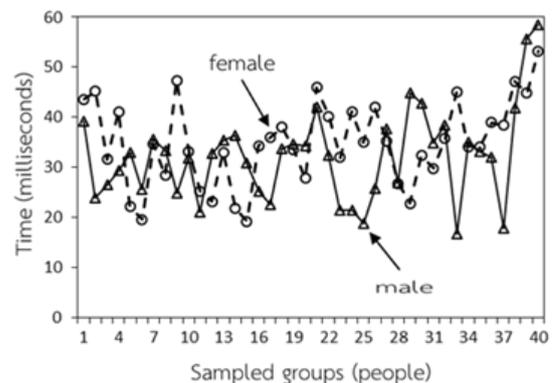


Fig. 14: Measured time spent AFTER alcoholic beverage consumption from the alcohol measuring machine between male and female testers

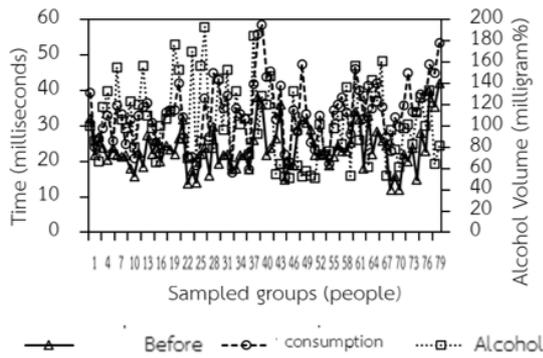


Fig. 15: Comparison of the time spent **BEFORE** and **AFTER** alcoholic beverage consumption from the alcohol measuring machine between male and female testers with respect to the alcohol volume (milligram%)

Test Parameter	N	X	S.D.	t	df	p-value
Males	40	22.70	5.40	-1.894	39	0.066
Females	40	25.18	8.05			

Table 1 Comparison of the results between males and females **BEFORE** alcoholic beverage consumption through the proposed application.

Test Parameter	N	X	S.D.	t	df	p-value
Males	40	32.22	9.17	-1.540	39	0.132
Females	40	35.11	8.29			

Table 2 Comparison of the results between males and females **AFTER** alcoholic beverage consumption through the proposed application.

From Fig. 13 and Table 1, the finding suggests that 40 males have the mean time taken for the nervous system's response and commands before consuming the alcoholic beverage with the equivalent value of 22.7 milliseconds; where the highest and lowest amount of time are 38 and 13.60 milliseconds, respectively. Alternatively, 40 females have the mean time taken of 25.18 milliseconds; where the highest and lowest amount of time are 49.60 and 12.00 milliseconds, respectively.

From Fig. 14 and Table 2, the finding suggests that 40 males have the mean time taken for the nervous system's response and commands after consuming the alcoholic beverage with the equivalent value of 32.22 milliseconds; where the highest and lowest amount of time are 58.4 and 16.80 milliseconds, respectively. On the other hand, the finding suggests that 40 females have the mean time taken for the nervous system's response and commands after consuming the alcoholic beverage of 35.11 milliseconds; where the highest and lowest amount of time are 57.4 and 19.20 milliseconds, respectively.

The analysis result for the correlation between the amounts of alcohol consumed and nervous system's

response and commands, between males and females, before alcoholic beverage consumption through the application for processing the evaluation on a smart phone with the Android operating system is drawn for conclusion. The evaluation is being done on the same sample persons with the analysis result of before and after consuming alcohol as determining factors through the Pearson Product Moment Correlation Method, with the value of coefficient of correlation presented in Table 3.4.

Variables	Alcohol Volume	Time taken for response after alcohol consumption
Alcohol Volume	1.000	0.316**
After consuming alcohol	0.316**	1.000

Remark: ** has significance in term of statistic at level of 0.01

Table 3 Coefficient of correlation between amounts of alcohol consumed and nervous system's response and commands, between males and females, **BEFORE** alcohol consumption through the application for processing the evaluation

Level of consumed alcohol (mg%)	Testing Time (Milliseconds)			
	Highest	Lowest	Mean	S.D.
1-50	47.40	16.80	26.40	9.07
51-100	53.20	18.80	32.16	8.22
101-150	56.40	29.40	37.12	6.26
151-200	58.80	35.20	40.98	7.04

Table 4 Medium values of time taken for the nervous system's response and command for each level of alcohol consumption

It can be concluded from Table 3 that the coefficient values between variables with significant statistic at the level of 0.01: level of alcohol consumed and time taken after consuming alcohol. Findings suggest that the relation between the two variables is directly proportional, meaning that when the amount of consumed alcohol increases, so does the amount of time that is taken for the test.

From Table 4, it can explained that for the time taken to complete test for the alcohol range of 1-50 mg%, the mean testing time is 26.40 milliseconds, the highest and lowest time taken to complete the test are 47.40 and 16.80 milliseconds with the standard deviation equal to 9.07. For alcohol range from 51-100 mg%, the mean testing time is 32.16 milliseconds, the highest and lowest time taken to complete the test are 53.20 and 18.80 milliseconds with the standard deviation equal to 8.22. For alcohol range from 101-150 mg%, the mean testing time is 37.12 milliseconds, the highest time taken to complete the test is 56.40 milliseconds, the lowest time is 29.40 milliseconds with the standard deviation equal to 6.26 and For alcohol range from 151-200 mg%, the mean testing time is 40.98 milliseconds, the highest time taken to complete the test is 58.80 milliseconds, the lowest time is 35.20 milliseconds with the standard deviation equal to 7.04.

4. Conclusions

From the analysis and summarization of research results, the fighting can be concluded as follows:

(1) Comparison test result for nervous system's response and commands between males and females before alcohol consumption through the application is found to be not different but average value of males and females' age has different time needed for response because age has the direct effect on a person's responding to press stop button. When eyes see the red light stopping, the action of stop button pushing follows. Familiarity and past experience in using smart phone also plays an important key in pushing stop button as well.

(2) Comparison test result for nervous system's response and commands between males and females after alcohol consumption through the application is found to be not different. This shows that level of alcohol consumption has direct effect on nervous system's response and commands for pressing stop button. Once seeing the red lights become paused, the pushing of stop button takes place for both males and females.

(3) Correlation between the amount of alcohol being consumed and the time taken for testers from means of evaluating the nervous system's reception and command of each individual between males and females after the consumption of alcohol through application; alcohol ranging interval 1-50 mg%, 51-100 mg%, 101-150 mg% and 151-200 mg%, suggests that when testers consume the amount of alcohol in the range of different intervals, they are affected in term of the ability for nervous system's response and command evaluation. The time taken to complete the test evaluation increases after the consumption of alcohol, which is in accordance with [8] with the findings suggest that the amount alcohol in the blood of the victim from the accidents on the road mostly lies between 151 to 300 mg percent which is considered as being intoxicated in moderate level. This degree of alcohol deteriorates the reception nervous system, results in the non-corporation of muscle functionality, strutting in an improper fashion, swollen tongue, unclear vision and longer the amount of time taken to make a decision. Comparatively, the amount of alcohol in blood levels ranging from 50-150 mg percent is considered as slightly intoxicated, affecting the function of brain with control duties to be suppressed. Visualization and the corporation among body muscles also deteriorate.

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References

- [1] Phimjong, P., (2013). Study of Factors Affecting Reaction Time of Motorcycle Riders .Department of Industrial Engineering, Suranaree University of Technology, Thailand.
- [2] Department of Physical Education. (2013). Basic Physical Fitness Test Manual .2nd ed. Department of Physical Education, Ministry of Tourism and Sports, Thailand.
- [3] Limsathlankul, C., (2002). The Construction of a Response Time Machine for Measuring Eye-Hand Co-ordination of Ball Passing in Basketball .Master of Education (Physical Education), Ramkhamhaeng University, Thailand.
- [4] Suphakitamomphan, C., (2013). The Design and Construct of Whole Body Reaction Time Instrument Set .Department of Physics, Faculty of Science, Rangsit University, Thailand.
- [5] Kummalue, K., (2014) .Physical Fitness Test System on Mobile Phone Using Accelerometer Sensor and Audio Detection .Master of Science Software Engineering, Chiang Mai University, Thailand .
- [6] Robmeechai, S., (2011) .Recommended Exercise Healthcare System on Android Operating System .Master of Science Information Technology, King Mongkut's University of Technology North Bangkok, Thailand .
- [7] Anakkapan, A., (2014). Hearing Test Application on Android Mobile Operating System .Master of Science Information Technology, King Mongkut's University of Technology North Bangkok, Thailand.
- [8] Dreisbach, (1976). Bureau of Traffic Safety v .26 Pa .Commw .201, 363 A.2d 870.

Biographies



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