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Impact of Age Level Intelligence and Components of the Game on Simulated Response Measure in Human Computer Interaction

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Abstract

In today's world, as every work that is carried out by human being are proceeded with speedy manner, since the technologies are growing rapidly in every moment. In view of this growth computer software and hardware technologies finds vast improvement in computer professional environment. In this environment, Human Computer Interaction (HCI) has emerged as a design oriented field of research, directed at large towards innovation, design and construction of new kinds of information and interaction technologies. "HCI is a discipline concern with the design evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them". Human Computer Interaction study is the region of intersection between psychology and the social sciences on one hand, computer science and technology on the other. These intersection psychological factors are analyzed with display rate and response time determinants of computer system. Computer system responds time and display rate are important determinants of user productivity, error rates, working style, and satisfaction. Satisfaction generally increases as the response time decreases, but there may be a danger from stress induced by a rapid pace. As users pick up the pace of the system, they may make more errors, if these errors are detected and corrected easily, then productivity will generally

increase. If errors are hard to detect or are excessively costly, then a moderate pace may be most beneficial.

Though the hardware and software technologies are functioning faster but there is query that is all aged game people who uses the high speed computer can able to work faster on per with the speed of today or feature computer. In this case, we propose a model to simulate an analysis of interaction between cognitive response to the brain under different age game which insist the actual speed of brain response in turn, makes the human being perceive work with different speed and also identifying the different working speed of computer response and make performance comparative study to extract conclusion and suggestion of utilization in computer interaction. The few cognitive factors are considered in which reflects to vibrate the brain signals which may affect the response on proceeding with work. They are development of sensation and perception, memory utilization and changes, thinking, problem solving ability, attention, interest, attitudes, aptitudes, emotions. Hence we believe that, this proposed model may help to improve the ability of human being with the ability of computer technologies.

Keywords: Response time, age game, cognitive load, Intelligence, RPM

I. INTRODUCTION

User interface design is a subset of a field of study called Human Computer Interaction. HCI is the study, planning and design of how people and computers work together so that a person's needs are satisfied in the most effective way.HCI designers must consider a variety of factors: What people want and expect, what physical limitations and abilities people possess, how their perceptual and information processing systems work, and what people find enjoyable and attractive [11].The need for people to communicate with each other has existed since we first walked upon this planet. The lowest and most common level of communication modes we share are movements and gestures. Movements and gestures are language independent, that is, they permit people who don't speak the same language do deal with one another.

Computers ability to deal with a human communication was inversely related to what was easy for people to do. The computer demanded rigid, typed input through a keyboard; people responded slowly using this device and with varying degrees of skill. The human computer dialog reflected the computers performance, consisting of one style or a combination of styles using keyboards, commonly referred to as command language, question and answers, menu selection, function key selection and form filling [11].

Within the past few years, the computer system has grown and used from an information medium to a workspace where users manage tasks of growing complexity. Performance and success in these tasks depend not only on the users' abilities, for example, knowledge and working memory capacity [7] but also on the

task itself. One of the major problems in exploring cognitive load is the problem of measurement. How can we assess cognitive load in a particular task and how can we test whether a principle may effectively reduce cognitive load? How can we measure the improvements in user efficiency or even user satisfaction? Which exhibits in cognitive load theory (CLT). Based on works about problem solving, expert versus novice research, and learning and working memory, Sweller found that problem-solving strategies may interfere with successful learning and schema acquisition. Sweller et al.[7]

II. LITERATURE REVIEW

A) Definition

The word "**cognitive**" refers to the thought process toward awareness or knowledge, or the mental process of knowing, including aspects such as awareness, perception, reasoning, and judgment.

B) Notion of HCI

The user interface is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct. The user interface has essentially two components: Input and Output. Input is how a person communicates his or her needs or desires to the computer. Some common input components are the keyboard, mouse, trackball, one's finger (for touch sensitive screens), and ones voice (for spoken instructions). Output is how the computer conveys the results of its computations and requirements to the user [11]. These shows that how for user has given importance in interacting with high end computer system and various applications level. It initiates the cognitive approach of human mind.

C) Approach of Cognitive model

Attention is the result of cognitive processes that guide the user's focus in a controlled fashion. One cognitive model of attention, the spotlight model, uses an analogy of a beam of light to represent attention. The illumination of the center of the beam is strongest and represents the focus of attention. The spotlight weakens the farther it is from the center. Once an object has been processed, the intentional spotlight can be shifted from one object to another. Eye movements can be viewed as an index of attention analogous to the spotlight metaphor and facilitate measuring intentional shifts from one location to another. Attention in the presence of eye movements has been labeled overt attention. There are also a number of models of attention based on experiments that use stimuli presented at durations too brief for the execution of an eye movement. Experiments of this sort have identified several important results that together are labeled covert. Covert attention models describe a number of important phenomena, chief among these being the ability to direct attention to different locations in space in the absence of eye movements [6]

This ability would seem to be at odds with the overt attention models that require eye movements in order to focus attention.

The current view, known as the pre-motor theory, reconciles this discrepancy by asserting that both types of attention are controlled by similar mechanisms and that covert attention would normally direct saccadic eye movements to appropriate objects except when task limitations prevent doing so. Support for this view comes from experiments indicating that target detection/discrimination is best when target location coincides with the location of saccades.

These and similar results have led Kramer and McCarley (2003) to conclude that covert attention and spotlight attention are tightly coupled.

There are a number of physical features in the visual world that draw a user's attention. Say for an instance, to draw attention in Web pages, the following phenomenon are consider, these include motion, size, color, text-style, the presence of images, and the position of components on the Web page. Motion is one of the most frequently discussed of these qualities, because the visual system is so highly sensitive to motion as evidenced by velocity detection thresholds as small as 1 to 2 minutes of arc/sec. Motion has also been shown to attract attention away from other stimuli[2], Like motion, size is also a powerful attractor of. Large images are often fixated before and for longer durations than small ones. Similarly, when given a choice, participants read large text in advertisements before small text. Images (defined here as non textual characters such as icons, photographs, and graphics) have also been found to capture attention. In fact, some studies have indicated that they actually help guide a reader's attention in examining newsprint. Other studies have shown that the presence of an image can make a warning stand out from its surrounding text[3].

Human factors psychologists have long been aware of are the primacy of color in the design of signs and displays. Color "pop-out," where colored objects stand out in an array of non target items is a well known phenomenon [10]. This phenomenon is used in numerous situations where high attention and delectability are desired, for example, the design of warning labels[1] and highway signs[9].

Publishers frequently use text style as a means of capturing attention in printed material by bolding, underlining, or italicizing key words to make them stand out from words in plain text. Similarly, graphic designers know that the saliency of different positions can convey importance. For example, in Western culture the top left corner of a display is typically looked at first and elements within this area are perceived as more important than those in other areas; whereas the top right corner plays a similar role in Eastern culture [5].

D) Responses to poor design

1 Psychological Factor

Typical psychological responses to poor design are:

Confusion, annoyance, frustration, panic or stress, boredom: These psychological responses diminish user effectiveness because they are severe blocks to concentration.

Thoughts irrelevant to the task at hand are forced to the users attention, and necessary concentration is Impossible. The result, in addition to higher error rates, is poor performance, anxiety, and dissatisfaction[11]

2 Physical Factor

Psychological responses frequently lead to, or are accompanied by, the following physical reactions.

Abandonment of the system:

Partial use of the system: Indirect use of the system, Modification of the task Compensatory activity, Misuse of the system, Direct programming:

These physical responses also greatly diminish user efficiency and effectiveness. They force the user to relay upon other information sources, to fail to use a systems complete capabilities, or to perform time consuming "work -around" actions.

E. Response time Approaches

1. System responsiveness should match the speed and flow of a human thought processes.

- **A.** If continuity of thinking is required and information must be remembered through out several responses, response time should be less than one or two seconds.
- **B.** If human task closures exist, high levels of concentration are not necessary, and moderate short term memory requirements are imposed; response times of 2 to 4 seconds are acceptable.
- **C.** If major task closures exist, minimal short term memory requirements are imposed; responses with in 4 to 15 seconds are acceptable.
- **D.** When the user is free to do other things and return when convenient, response time can be greater than 15 seconds.

2. Constant delays are preferable to variable delays.

- **E.** The optimum response time is dependent upon the task:
- **F.** Satisfaction with response time is a function of expectations:
- **G.** Dissatisfaction with response time is a function of ones uncertainty about delay
- **H.** People will change work habit to confirm to response time:
- **I.** Constant delays are preferable to variable delays:
- **J.** More experienced people prefer shorter response times: People work faster as they gain experience, a fact that leads shneiderman (1987) to conclude that it may be useful to let people set their own pace of interaction. He also suggest that in the absence of cost or technical

feasibility constraints, people will eventually force response time to well under 1 second. In general the longer people interact with a system, the less delay they will tolerate[11].

III. PROPOSED FRAMEWORK PERSPECTIVE ANALYSIS

From the literature study, it was discussed that, how the cognitive process are instigate to different perspective. Basically the human minds might work based on self concentration, self interest, self attention, self thinking, self initiation and so on. But these factors can be relates with age and time constraints of human and utilization.

Based on various age factors, the work progress of human mind (cognitive thought) may vary with response to above mentioned factor. Now-a-days, the high configured systems and various application developments existing in the present market may gives exposures to utilize it, in which it makes the human mind of different age game people feel easy or complex that rely on above factors.

Since from age 5 to old age, the people are using the computer for different purposes in order to serve their needs. But the cognitive thought process may vary on par with the purpose they use different configured system**.** In these circumstances the following comparatives are made with the development of sensation and perception, memory utilization and changes, thinking, problem solving ability, attention, interest, attitudes, aptitudes, emotions. These factors may applied on different application development and usage of application which directly proportional to the mind growth and development of physical factor of various age game.

A). Approach of RPM Test

Intelligence towards Response Time results from many specific issues related to Response Time like the substantiate that slow system response time leads to dissatisfaction; assess the point at which users may become dissatisfied with system response time; determine a threshold at which dissatisfaction may lead to discontinued use of the application, and determine if experience influences response time tolerance.etc.

Bearing the above important dimensions which may contribute to the positive or negative reactions of the users towards the Response Time, as a first step in the development of the response time Productivity, a number of statements of opinions of users about the Response Time were collected from a number of sources as follows:

Experiment design : Each subject used the same static application test except for the varied marks obtained. Refer to below diagram of the experiment.

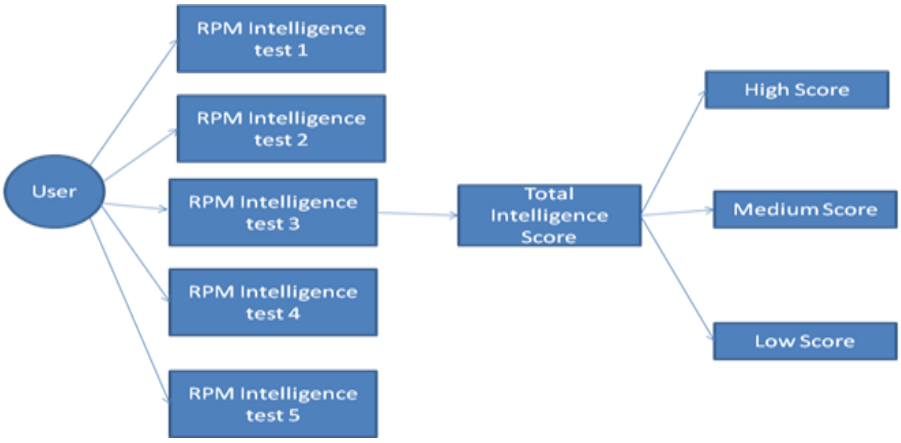


Figure 1. Experiment Design for Intelligence test (RPM test)

The experiment was a "between-subjects" design in that each subject of each Game was used only once during the experiment (Goodwin, 1995). For example, Game 2 was exposed to a three-second response time rate, and Game 2 was not used again in the experiment. This helped to control for learning bias within subjects. The application used in the experiment was a system designed and constructed exclusively for response time determination. The application required the subject to search for brain response time that would meet a given set of criteria: gender, age, education levels, game response time etc. The application is consistent with other internet browser-based systems. The criteria used to develop the application were based on the need to have a computer-human interface that was acceptable (or neutral) to virtually any user.

The RPM test design are a static pages. The user simply read the directions and gives the tick marks. The selection device was a manually by pen. The preliminary Main Menu is shown in above Figure. The user instructions and "keyword" scripts for the system are available upon request to the authors.

Hypothesis: There is no significant difference between intelligence and in their game response time for different Games score.

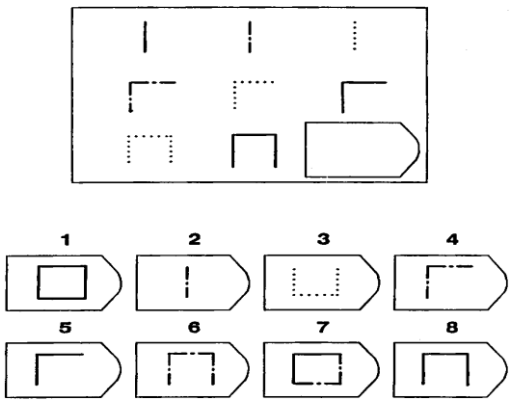


Figure 2. Illustrative Progressive Matrices item. Respondents are asked to identify the piece required to complete the design from the options below. (The item shown here is not from the current range of tests.)

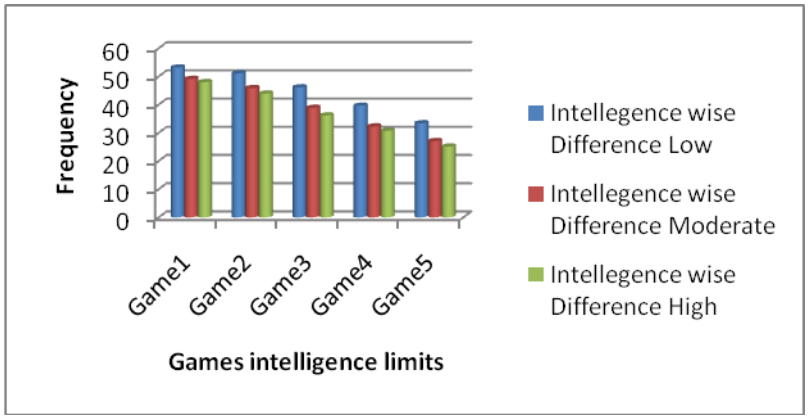
Table 1. Summary of ANOVA for the Intelligence Concerns about the Inclusion of subjects with Game response time and Intelligence wise difference.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Game 1	Between Games	912.750	2	456.375	18.872	0.000
	Within Games	4570.453	189	24.182		
	Total	5483.203	191			
Game 2	Between Games	1669.057	2	834.528	52.067	0.000
	Within Games	3029.313	189	16.028		
	Total	4698.370	191			
Game 3	Between Games	3240.338	2	1620.169	94.411	0.000
	Within Games	3243.407	189	17.161		
	Total	6483.745	191			
Game 4	Between Games	2816.665	2	1408.332	70.109	0.000
	Within Games	3796.580	189	20.088		
	Total	6613.245	191			
Game 5	Between Games	2303.860	2	1151.930	61.775	0.000
	Within Games	3524.343	189	18.647		
	Total	5828.203	191			
Total	Between Games	52380.285	2	26190.143	74.193	0.000
	Within Games	66716.709	189	352.998		
	Total	119096.995	191			

(@ Not Significant at 0.05 level)

G1,G2,G3,G4,G5,total score it is clearly observed from the table that the calculated 'F' values is less than the table value at 0.05 level for 2 & 189 df. It is not significant at 0.05 levels.

Hence the null hypothesis the accepted. It is concluded that there is no significant difference between intelligence and in their game response time for Game1, Game2, Game3, Game4, Game5, and total score.



Intelligence wise differences

Figure 3. Mean Concerns three categories of Intelligence wise differences

B). Approach Performance of Age

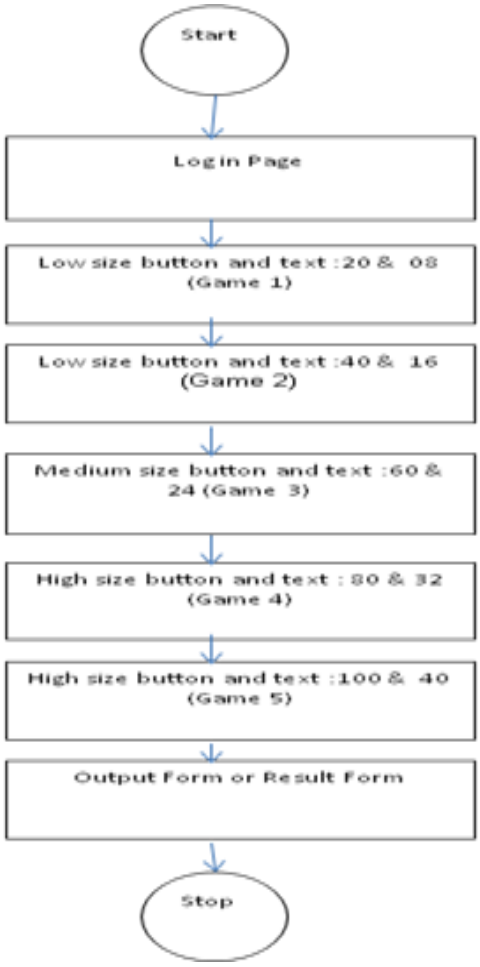


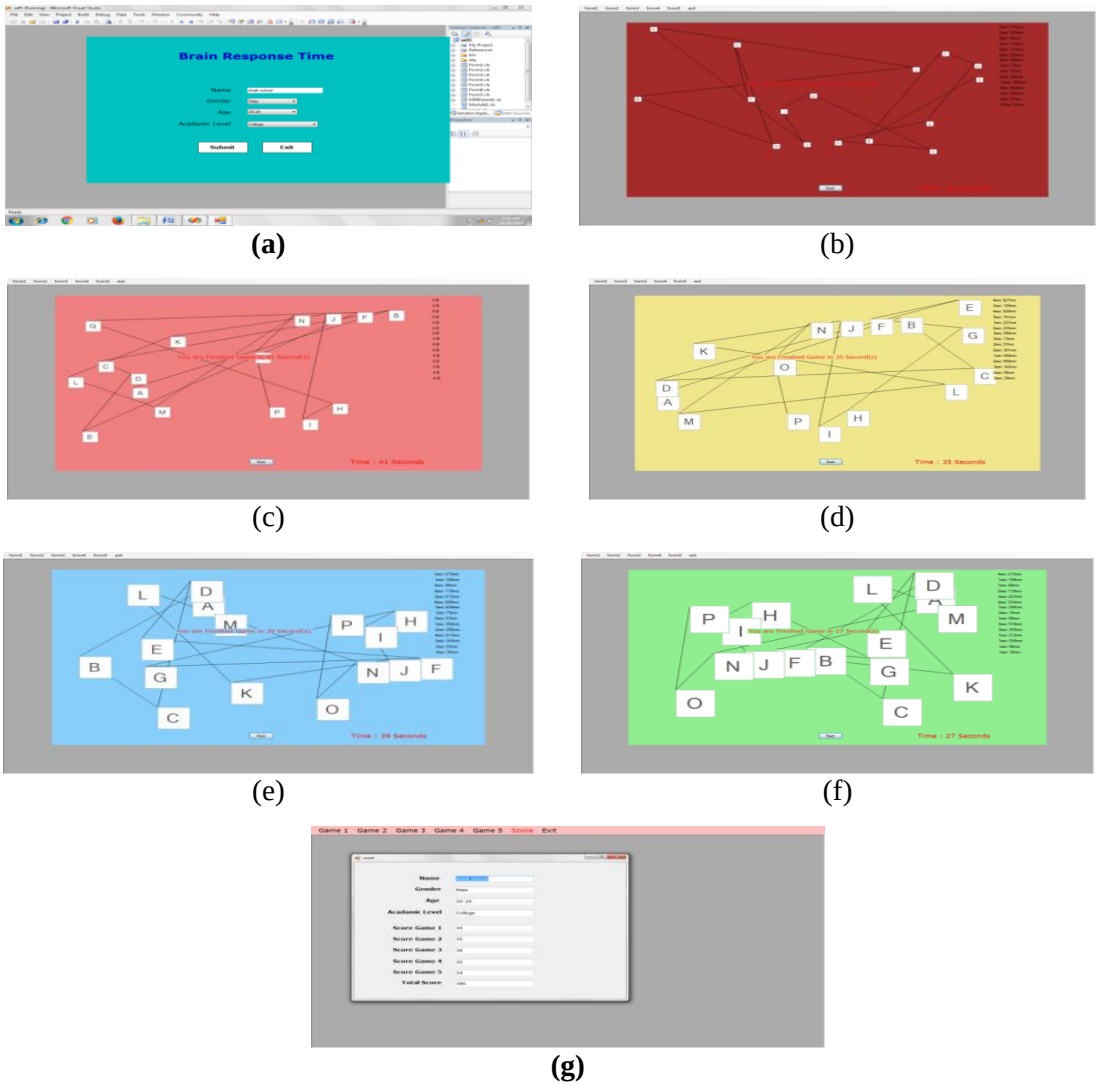
Figure 4. Flow chart Experiment setup for Game of five forms design

Sequence Screenshots

Graphical User Interface Components

The main objective of this thesis is to study the effect of different size of graphical user interface components on user responses. The following sections explain in detail the different size of components display and navigation components used in this study. Screen shots of some of the components are also included.

This section lists all the screenshots of the scenario described in the flow chart of Figure 6. Screen shots of the GRT (Game Response Time)



(a) (b) (c) (d) (e) (f) **(g)**

(a) Screen shot of the introductory page. Each subject was presented with this page at the start of the experiment **(b)** Introductory and Home page. **(c)** Buttons font size of 8 with order link of A to P. **(d)** Buttons font size of 16 .**(e)** Buttons font size of 24. **(f)** Buttons font size of 32, **(g)** Buttons font size of 40 with order link of A to P and all single page submission with completion time with seconds. (h) Screen shot of output form,

Figure 5. Game Response time of Screen shots

Hypothesis: There is no significant difference between age and in their game response time for different Game score.

Table 2. Summary of ANOVA for the significant difference between age and in their game response time for different Game score

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Score Game 1	Between Games	995.141	3	331.714	13.895	0.000
	Within Games	4488.062	188	23.873		
	Total	5483.203	191			
Score Game 2	Between Games	2644.224	3	881.408	80.668	0.000
	Within Games	2054.146	188	10.926		
	Total	4698.370	191			
Score Game 3	Between Games	4802.766	3	1600.922	179.046	0.000
	Within Games	1680.979	188	8.941		
	Total	6483.745	191			
Score Game 4	Between Games	3310.516	3	1103.505	62.814	0.000
	Within Games	3302.729	188	17.568		
	Total	6613.245	191			
Score Game 5	Between Games	3152.766	3	1050.922	73.847	0.000
	Within Games	2675.438	188	14.231		
	Total	5828.203	191			
Total Score	Between Games	70210.516	3	23403.505	90.002	0.000
	Within Games	48886.479	188	260.034		
	Total	119096.995	191			

G1,G2,G3,G4,G5,total ANOVA score it is clearly observed from the table that the calculated 'F' value is less than the table value at 0.05 level for 3 & 188 df. It is not significant at 0.05 levels. Hence the null hypothesis the accepted. It is concluded that there is no significant difference between age and in their game response time for G1,G2,G3,G4,G5,total score.

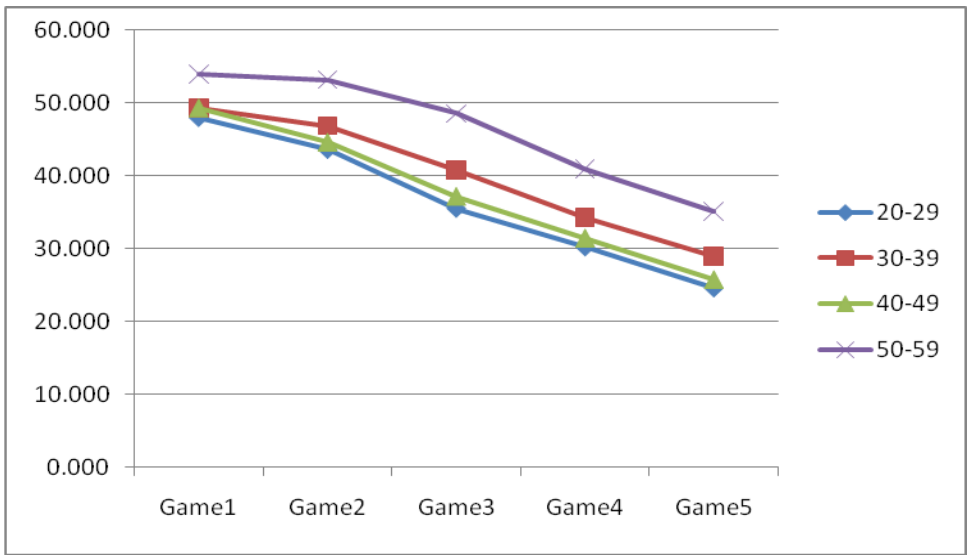


Figure 6. Mean Concerns of significant difference between age and in their game response time for different Game score

IV. DATA ANALYSIS FOR A STEPWISE REGRESSION

STEP WISE MULTIPLE REGRESSION ANALYSIS

Table 3. Variables Entered/Removed

Variables Entered/Removed(a)

Model	Variables Entered	Variables Removed	Method
1	Intelligence	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	AGE	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: Score Game

This first table tells you which variables were included in the model at each step: "Intelligence" was the single best predictor (step 1), and "Age" was the next best predictor (added the most), after "Intelligence" was included in the model (step 2).

Table 4. Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476(a)	0.227	0.223	4.723
2	.506(b)	0.256	0.248	4.646

a Predictors: (Constant), Intelligence

b Predictors: (Constant), Intelligence, AGE

Again, here are the R-squares. With "Intelligence" alone (step 1), 22.7% of the variance was accounted for. With both "Intelligence" and "Age" (step 2), 25.6% of the variance was accounted for.

Table 5. ANOVA(c)

ANOVA(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1244.359	1	1244.359	55.777	.000(a)
	Residual	4238.844	190	22.31		
	Total	5483.203	191			
2	Regression	1403.432	2	701.716	32.508	.000(b)
	Residual	4079.771	189	21.586		
	Total	5483.203	191			

a Predictors: (Constant), Intelligence

b Predictors: (Constant), Intelligence, AGE

c Dependent Variable: Score Game

This table now gives two *F*-tests, one for each step of the procedure. Both steps had overall Significant results (p = .000 for Intelligence alone, and p = .000 for Intelligence and Age).

Table 6. Coefficients(a)

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	64.502	1.953		33.029	0
	Intelligence	-0.404	0.054	-0.476	-7.468	0
2	(Constant)	82.644	6.954		11.885	0
	Intelligence	-0.762	0.142	-0.898	-5.361	0
	AGE	-2.173	0.801	-0.455	-2.715	0.007

a Dependent Variable: Score Game

Again, this table gives beta coefficients so that you can construct the regression equation. Notice that the betas *change*, depending on which predictors are included in the model.

These are the weights that you want, for an equation that includes just Intelligence and Age (the two best predictors). The equation would be:

Predicted Score Game = 82.44 – 0.762(Intelligence) + -2.173(Age)

The last table ("Variables Excluded from the Equation") just lists the variables that *weren't* included in the model at each step.

Table 7. Excluded Variables(c)

Excluded Variables(c)						
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	GENDER	.137(a)	2.163	0.032	0.155	0.995
	AGE	-.455(a)	-2.715	0.007	-0.194	0.14
	EDUCATION	-.078(a)	-1.058	0.291	-0.077	0.743
2	GENDER	.111(b)	1.756	0.081	0.127	0.967
	EDUCATION	-.124(b)	-1.674	0.096	-0.121	0.712
a Predictors in the Model: (Constant), Intelligence						
b Predictors in the Model: (Constant), Intelligence, AGE						
c Dependent Variable: Score Game						

Interpretation and APA writing template for the Stepwise Multiple Regression Results Above:

A stepwise multiple regressions was conducted to evaluate whether both intelligence, age were necessary to predict game score.

At step 1 of the analysis game variables intelligence and age entered into the regression equation and was significantly related to Game (a(intelligence) F (1,190)=55.78 p<0.001 and the multiple correlation coefficient was .476 indicating 22.7%. and Game (b(intelligence ,age)) F(2,189) = 32.508 P<0.001 and The multiple correlation coefficient and .506(b) indicating 25.6% of the variance of the game score could be accounted for age response scores.

The step 2 of the analysis intelligence and give below ('t'=2.163, p>.05), ('t'= -2.715, p>.05),('t'= -1.058, p>.05) ('t'=1.756,p>.05) and ('t'=1.674,p>.05)

Thus the regression equation for predicting game score response time was

predicted game score response time = Game(a)= -0.404 X intelligence 64.502, Game(b)= -0.762 X 82.644 = -2.173 X 82.644

The below regression equation shows relation between dependent variables Game and Independent variables, Intelligence, Age. It Compensation Simulated response

measure in relation to certain factors in human computer interaction and usability Benefits, response time important across different responses.

According to the perceptions of the 192 users there is a strong relationship Between Intelligence, Age is to improve Response time is important across different responses. Response time is not same for different users; depend on age, change the response time.

Response time is are important determinants of user productivity, error rates, working style and user satisfaction.

V. SUMMARY

The two experiments presented here show that, response time, there is considerably less difference between Intelligence and Age subjects in processing speed than has been supposed in prior research. The main reason Intelligence subjects are slower than Age and have wider distributions of response times across conditions is that the Intelligence subjects set more conservative response criteria than Age subjects, and Intelligence subjects have longer non decisional components of response time than Age subjects. Of course, it is likely that in other rapid. Two choice decision tasks, there is degradation in the quality of the information that enters the decision process for Intelligence versus Age subjects. For example, there might be decrements in extraction of perceptual information from difficult to see low usability low size of components stimuli or decrements in information extracted from long term memory, short term memory along with these decrements, however, our data suggest that much of the slow down observed in response time for Intelligence subjects will come from conservative response criteria.

VI. CONCLUSION

Response time is the one of the vital role factor in which human mindset with different Game response intelligence, age factors in Human Computer Interaction. As the development of the User Interface are rapidly changing from the invention of computer to till today, likewise the similar age, intelligence of people are put up in different user interface environment and intelligence have to enhance the working ability as per the dynamic changes. Since, once the people stick on to different user interface as to understand the nature of the user interface and make faster response time.

Because the response time initiate the user interface application and make further success in developing effective user interface hence psychological issues of Expected study on intelligence and Performance study on Intelligence (GRT) different Simulated response measure in relation to certain factors in human computer interaction.

Measurable things but not exact because of various factors involves in cognitive measurement. From the perspective of physical growth, few may be weak but they excel with high talent in utilizing higher end system and software. Hence it is concluded that the cognitive factors may coincide with usage of different configured systems which can be measured and varies with person to person.

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