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Designing Implementation and Scoring of Eysenck Personality Test (JEPQ and EPQR): Theory, Plan and Comparing it Features with Traditional Paper Based Form

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ABSTRACT

Using personal tests has always been a useful common key device to diagnose, consult and treat patients attending psychological and psychiatric clinics and consulting centers. Studies show that motivating the samples to honestly participate and complete relatively long tests on one hand and time consuming manual scoring system, which could include mistakes by testers, on the other hand are some of the challenges in implementing and scoring psychological questionnaires in form of classic paper based. Introducing computer as a valid means in psychic and psychological evaluations leads to creation of software of the tests which, in turn, results in high expenses, lack of access to computer in some cases, test anxiety to submit personal information in computer and potential hardware and software problems while implanting them. According to the studies, Eysenck personal questionnaire (EPQ) is one of the few questionnaires which is normalized for children, teens and adults in Iran. Improving construction, implementation and software disadvantages and keeping the merits of both forms, present study investigates designing and producing electronic devices and scoring of the questionnaire which is a combination of paper based and computer ones.

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INTRODUCTION

Many psychiatrists believe that personal differences could be measured based on relatively stable characteristics reported by the individual [7]. Eysenck [10] considered introversion and extroversion and neuroticism (stability-instability and emotionality) more effective than other features on describing personality. After a while, he added a third dimension and introduced it as a separate concept from the others. It was called psychoticism (p) [7].

50 years of study resulted in Eysenck personality scales which were created to measure main personal characters. These scales were introduced by individuals, friends, acquaintances, studies, psycho-physiologic tests and biochemical analysis based on quantitative scale [7].

Kaviani [21] studied using revised Eyseck personality questionnaire (EPQ_R) on youth population in Iran. Translating the questionnaire and adapting it with linguistic and cultural features, he investigated its validity on a group of students studying in Tehran University and Shiraz University and evaluated this questionnaire among Iranian youth and, then, revised its statements according to statistical analysis.

Revised Eysenck personality questionnaire was created to measure personality features and includes six scales: introversion-extroversion (E), psychoticism (P), psychosis (N), criminality (C), addiction (A), lying (L). [8].

Junior Eysenck personality questionnaire (JEPQ) was standardized by Eysenck and Eysenck [10]. It is the new revised version of hand writings of Eysenck personality (EPI) published in 1964 which included psychotism. JEPQ has three scales of extroversion (E), neuroticism (N), psychoticism (P), and a lie scale (L). Eysenck considered a different biological stem for each personality types. Eysenck considered a different biological stem for each personality type. According to Eysenck, extroversion depends on the activity of

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Ascending Reticular Activating Systems (ARAS), neuroticism on automatic functioning of nerve system [7] and psychoticism on balance of androgen and strogen hormones.

Eysenck considered personality types like introvert-extrovert, neuroticism-stability and psychoticism globally. He referred to the results of intercultural comparison of 24 studies on personality factors using adult Eysenck questionnaire and 10 more studies using JEPR to prove his vision [7]. He believes that this questionnaire is only applicable in England unless effective personality scale factors and effectiveness of each question, which compares personal scales, are validated [9].

Junior and adult Eysenck questionnaires were first used in 1970s in Iran. Studies on these field introduced useful information. Mahyar [24] used EPI to study normal and psychic Iranians. He suggested that the test was valid and reliable for both normal and patient groups. It should be noted that Iranians' score for neuroticism and lie scale were higher. Baraheni [2] also, used EPI to study extroversion and neuroticism among Iranian collage students and confirmed the validity of the scale as 0.74 to 0.84; however, he asked for further studies on validity of extroversion and lie scale. Hosseini, Mahyar and Razavie [18] used EPI to study the relation between personal scales and educational statues of high school students. Result showed low test-retest reliability (about 0.4) of extroversion, psychotism and lie scale test after five months; though, it should proper scale (0.71) for neuroticism. Comparing Iranian and English students in this study showed higher levels of neuroticism and psychotism among Iranians.

Improvement of computer science and its interaction with psychology [26,28,32] on one hand and improvement of study methodology in psychology field on the other hand made it important to use computers in many evaluations of mental and psychological processes [4,37,31].To other vice it is necessary to use valid personality questionnaires like EPQ-R to study clinical populations such as individual suffering from mood disorders, anxiety and depression disorders. Questionnaires like EPQ-R could be helpful to psychiatrists and psychologists to measure individual's personality [21].

Considering the importance of Eysenck personal test as a soften personal test among Iranian teens and adults and, also, as there was no electronic means to apply and score the test and paper based version was used in all studies, present study aims to design and make an electronic means to avoid differences and mistakes in applying, scoring and evaluating the result by researchers.

How to Build the Means:

Computers and software have been used increasingly in evaluations through late decades so that in 1990, 17 per cent of psychologists frequently and 36 percent sometimes used data gathered using computers [22]. There are more than 400 software programs available which could be found in press like; using computers in psychology: a list of software [34] from American psychology association; psychology evaluation by computer: an application usage by Butcher [3]. It is estimated that in 2004 most psychological tests would be mechanical and many of them were equipped with speech analyzers, physiological monitoring devices and offering vocal and visual stimuli. Using computer in psycho health not only includes computer evaluation, but also includes computer interviews, computer recognition, computer based education, direct treatment interventions, clinical consultants and assimilated psychological interviews [1]. Using computers in applications and interpretations in neuropsychology resulted in certain improvements [20] and, generally, in developed organizational contexts, it focused on organized sets and different expert issues. Characteristics of main test version and, then, the software were analyzed in Iran society to build the device.

Eysenck presented the test to a single group in two different times to prove its validity and reliability. Its internal reliability coefficient (Cronback alfa) were P=0.78, E=0.90, N=0.88 and L=0.82 for men and P=0.76, E=0.85, N=0.85 and L=0.79 for women. Also, using open test method and applying EPQ, it was applied twice for a month interval on 230 samples and correlation coefficients were reported as P=0.77, E=0.83, N=0.76 and L=0.76 for men and P=0.81, E=0.8, N=0.81 and L=0.80 (Eysenck, 1975).

Correlation coefficient of Iranian sample with retest method in a two-month interval was reported as P=0.72, E=0.92, N=0.89 and L=0.88 which showed high and acceptable validity of EPQ.

Table 1: Mean and standard deviation in EPQ-R personal scales for men in different age groups **.**

Lying (L)		Addiction (A)		Criminality (C)		Neurocticim (N)		Psychoticism (P)		Introversion-extroversion (E)		Age groups
SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	
4/44	9/24	4/58	10/97	4/66	12/55	4/96	11/97	4/21	7/82	4/56	13/59	15-19
3/70	9/29	5/07	10/66	5/12	12/35	5/68	11/70	5/06	7/19	4/35	14/48	20-29
3/25	9/72	4/27	9/24	4/29	10/60	5/05	10/70	3/13	5/53	3/04	13/74	30-39
3/58	10/16	4/42	10/12	4/99	11/57	5/23	11/56	3/37	5/59	4/49	13/06	40-49
4/07	11/67	4/74	9/76	5/17	11/10	5/46	10/83	3/85	5/81	4/75	12/69	>50

Revised form of Eyenck personal test for adults (EPQ_R) was adjusted to Iran community and included 106 yes/no questions in six scales: introversion-extroversion (E), psychotics (P), neurotics (N), criminality (C),

addiction (A) and lying (L), which has mean and normalized standard deviation for each comparison and for different gender and age group.

Table 2: Mean and standard deviation in EPQ-R personal scales for women in different age groups.

Lying (L)		Addiction (A)		Criminality (C)		Neurocticim (N)		Psychoticism (P)		Introversion-extroversion (E)		Age groups
Mean	SD	Mean	SD	Mean		SD	Mean	SD	Mean	SD	Mean	
3/72	10/37	4/80	11/68	4/86	14/91	5/48	15/02	3/76	7/79	4/40	14/89	15-19
3/2	10/59	5/55	10/96	5/49	13/35	5/87	13/76	4/94	7/42	4/57	13/98	20-29
3/26	11/72	4/25	10/80	4/97	13/44	5/30	13/68	3/72	6/37	4/52	13/35	30-39
3/62	12/00	4/29	10/17	4/54	12/28	5/29	12/71	3/11	5/24	4/55	13/68	40-49
3/43	13/04	4/45	10/26	4/99	12/74	5/434	12/81	3/89	6/04	4/43	12/56	>50

Rahimi nejad [29] normalized junior Eysenck personality questionnaire (JEPQ) to Iran community which included 80 yes/no questions and four scales: introversion-extroversion (E), psychotics (P), neurotics (N) and lying (L). Normalized mean and standard deviation are presented for each scale and gender/age group.

Table 3: Mean and standard deviation in JEPQ personal scales for male students in different age groups

Lying (L)		Psychotism (P)		Neuroticism (N)		Extroversion (E)		Number	Age
SD	Mean	SD	Mean	SD	Mean	SD	Mean		
4/38	11/5	3/79	3/95	4/78	3/78	3/66	17/08	141	12
4/54	10/87	3/27	4/35	4/09	11/28	3/37	17/32	134	13
4/35	10/40	3/48	4/59	4/19	10/61	3/68	16/88	142	14
4/20	8/93	3/11	4/39	4/43	11/05	3/82	16/02	129	15
4/18	9/98	3/44	4/57	4/37	10/84	3/82	16/21	106	16
/26	9/01	2/58	4/72	3/92	11/01	3/73	16/11	113	17
4/48	8/99	3/17	4/34	4/48	10/65	3/46	16/34	136	18

Table 4. Mean and standard deviation in JEPQ personal scales for female students in different age groups

Lying (L)		Psychotism (P)		Neuroticism (N)		Extroversion (E)		Number	Age
SD	Mean			SD	Mean	SD	Mean		
4/43	12/86	2/49	2/28	4/75	10/27	3/77	16/64	120	12
4/70	11/93	2/52	2/68	4/73	11/60	4/02	16/12	13	13
4/51	11/58	2/49	2/81	4/96	13/02	3/68	15/12	150	14
4/12	10/78	2/62	3/41	4/65	13/34	3/94	15/11	178	15
4/40	10/13	2/71	3/88	4/15	13/23	4/48	14/20	202	16
3/82	9/76	2/34	3/63	4/33	13/12	4/27	14/53	167	17
4/16	9/76	2/62	3/88	4/66	12/84	4/16	14/90	117	18

Increasing the usage of computer based psychic questionnaires, researchers were motivated to build an electronic device to apply and score the questionnaire instead of traditional paper based method.
Based on what is said, revised EPQ-R for adults and JEPQ and given points in both forms, software and hardware structure of Eysenck personality questionnaire (Iranian version) was constructed as follow.

Structural Features of the Device:
Hardware Structures:

The design is similar to mini laptops with 20×4 LCD characters, 16-key keyboards, AVR microcontroller, internal battery and charge circuit with its charger, answering key, LED lights and other circuits and internal attachments.

Software Features:

Present study made use of Atmega 32 micro controller made by Atmel Company. BASCOM AVR software was used in programming which its standard programming language is BASIC.

More than a thousand lines were written for this program which includes data functioning from input (keyboard), data sending function to LCD for monitoring, library functions to categorize information and comparing sampling answers and given criterion by tester and scoring system.

Some other technique used in programming the project is using several control loops as systematic and control functions, which avoids the increase of program volume and, as the result, lower system processing.

Device Operation:

Turning on the device with the button on it, tester faces a question on the screen which ask them to choose number 1 for adult Eysenck personal questionnaire and 2 for junior Eysenck personality questionnaire. Choosing the type of questionnaire, tester uses keyboard on the device to submit age gender and number of samples in device and puts it in front of the sample.

Later, samples reads or hear each question and push a button on the device for yes or no answer till the last question. There are three LED lights on the device to let tester control the process and answering methods to the questions by samples. Process is as follow:

Green light: makes sure that samples are answering the questions, for each answer the lights turn on and off.

Red light: answering 20 questions, if the sample chooses equal number of yes and no answers, because of lack of attention or impatience of the samples while answering, tester can notice that.

Yellow light: answering 20 questions, if 80 per cent of answers are yes or no, because of samples lack of attention or not reading the questions carefully, tester can recognize it easily. This device could be used at least for two hours by samples and it could be recharged to be used again.

Device Output:

Answering all questions and according to the type of the exam, two almost similar outputs are shown on the screen which can be saved. Answering EPQ-R for adults, pressing enter button, age, gender, sample number and score for six scales, including introversion-extroversion (E), psychotics (P), neurotics (N), criminality (C), addiction (A) and lying (L), are shown on the screen. Having mean and standard deviation for each scale and different gender-age group, standardized scores (Z) for each of the measured scales in test are presented on the screen for faster, better and more reliable interpretation.

Answering JEPQ, on the other hand, when enter button is pressed, factors such as age, gender, number of sample and scores of four scales needed in the test, including introversion-extroversion (E), psychotics (P), neurotics (N) and lying (L), are shown on the screen. Having mean and standard deviation for each scale in different gender-age group and, also, for better, more reliable interpretations by tester, standardized scores (Z) of measurable scales in test are shown on the device screen.

Advantages and application of using the device

Here are some advantages of using a device which can offer a mixture of scoring and implementation of both computer and paper questionnaires:

- It is possible to use it any time and any where easily
- It significantly saves the interval time between implementation and scoring
- It is possible to have quick feedback for scales considered in personality questionnaire for each sample
- It is fast to apply, score and check which leads to faster decision making
- Safety: there is no more concern about losing answer sheets before, while and after test
- Flexibility: questionnaires match samples features
- Systematic function: it is possible to unite the data from a sample
- It is easier to attract the samples to participate
- It is possible to record samples behavior and reactions while answering the questions
- It is possible to present a comprehensive and complete report about samples.

Some applications and usage of the device are

- Using it in all diagnostic centers and clinics
- Using it in all psychological centers
- Using it in all psychological laboratories
- Using it for collage researches and studies
- Using it in schools and educational institutes to guide and screen students
- Using it with illiterate samples
- Using it where there is no access to computers
- Using it for cases that fast decision making or interpretation is needed
- Using it in centers which need clinical data in addition to psychological data
- Using it in cases where data is needed to be saved for a long time

Comparing Features and Functions of test Application of Electronic Device and Paper Based Form:

As sample answers recording and scoring procedure by device are done with software and thousand lines of programming in device microcontroller, it is compared with paper based questionnaire on following functions:

- Soft and adaptable computer tests: soft computer based tests leads to proper distribution of the tests which should introduce proper features. They include mea, distribution and score forms [38]. Equality of computer based and paper based tests, studied as matching, refers to the possibility to compare these two forms of testing. If accurateness is considered in computer based tests, equality is expected. Weiner [39] studied the equality of computer base and paper based tests. 424 samples participated in the study which included time limited recognition-ability tests. Measurement study plan was frequent where it was computer based in the first stage, paper based in the second stage and both in the last phase. Correlation was 0.98 and score distribution was

congruent. Studies showed that validity of computer based tests (software) was higher than paper based ones. Computer based tests showed to be more functional especially in data management [11].

- Acceptance of the samples: experiences showed that samples generally prefer computer based tests Maclid, . In an experimental research, Weiner [38] passed questionnaires to 310 collage-students finishing a test. Results showed that test experiences with computer was acceptable and sensible (78 percent agreed, 5 percent disagreed and 15 percent abstaining). 51 per cent preferred computer based testing for more sensitive tests and 34 per cent liked paper based tests better. Also, 65 per cent considered computer based tests to be fair.
- Transformability of traditional and computer based tests: many studies have investigated the issue. For instance, Hofer and Green [15] mentioned different conditions of traditional and computer based tests and suggested that they were not comparable; however, many researchers believe that these tests could be converted to the other, and, also, be used instead of each other.
- Presentation and administration of the test: administration of computer based tests id different from paper based. For instance, it is possible for the samples to use headphones to listen to the questions, so individuals with visual or auditory disabilities can take the test, too. It is, also, possible for samples to interact through using software [23].
- Getting personal information from the samples: studies showed that clinical interviews match computer ones. They suggest that samples feel more relax to offer their personal information to a computer rather than a psychologist. In addition, these studies showed that computer based programs were efficient to diagnose behavior problems. Ruth et al. interviewed 173 samples using computer diagnostic interviews (C-DIS) with DSM-III-R in clinics. Except for addiction and antisocial cases, there was a sensible agreement between two methods and C-DIS predicted sample disorders with accuracy of 90 percent.
- Comparing computer based and paper based tests: many studies investigated the possibility of comparing these two forms of testing. Jemelka et al, administered attitude test on 98 female students in both forms of computer and paper based, They moderated the administrations and showed that mean and variance resulted from each method could be compared. Holden and Hickman [16] derived computer and paper based frameworks from Jenkins study, This scale is used to distinguish people with type A personality. 60 samples participated in each form, Results suggested the comparability of their variance, means, reliability and validity. Mertin, Ruch [25] used Holden and Hikman model of EPQ and Karl depression range, Half of the sample answered to computer based questionnaire and the other half took the standard questionnaires. Mean and standard deviation of these two administrations were sensibly comparable. In a more complicated study, Jemelka [19] administered a computer based test on 100 criminals in a prison. It included summery of mental health, personal history interviews, group form of MMPI test, revised form of Hushbar beta test, suicide possibility scale, Bos Dorki violence list and Vetran alcoholism test. Results were shown in a chart which ranked violence, addiction, suicide and interest in being sacrificed. Along with this, clinical diagnostic tests were hold using DSM-III-r and criminals were ranked according the given scales. There was a reasonable ranking order (82%) between these two methods.

Studies over comparing traditional and computer based tests mostly made use of MMPI and MMPI2 [32]. They showed that differences of administration of two tests were negligible and their correlation was 68 to 98 per cent [36]. Higher correlations (92 to 97 %) were reported in some studies [35]. Also, in an ultra-analytic study [11] reviewed 14 studies from 1974 to 1996 for adaptability of MMPI and MMPI2 tests, they showed that there was a small difference for T between scores and correlation of traditional and computer based MMPI and MMPI2 tests as almost one. Based on these, researchers believe that it is possible to compare computer based and paper based forms of MMPI test. However, Honaker [17] suggested that statistical analysis were not enough to make the comparison possible.

Conclusion:

Nowadays, computers play an important role in test making procedure and, according to the studies, it could be said that its role in administration, scoring and interpreting psychological tests is developing. They are assumed as the best connecters to administer the tests. Advantages of computer tests makes it a good alternative to traditional form; however, high expenses like buying computers and untrained users, specially in undeveloped countries, results in following paper based model in some countries.

As computer based and computer adaptive test are generally equal to paper based tests [21] and also, introduce better conditions, it seemed sensible to make use of them. It specially saves time in scoring and interpretation procedures [27]. Although computer based tests are administered differently from paper based tests, many studies on comparing them showed that their psychological scales are close to each other, and according to certain advantages of computer based tests, they could be used in all cognition levels.

During recent years, computer based tests were introduced as proper alternatives of paper based tests in psychological measurements due to their wide usage, taking less time, more control over effective factors, smaller human mistakes in scoring and more valid and reliable data. In other words, researches of this field are moving alongside with new technology to alter traditional methods to more modern versions. It clears the

importance of designing and producing electronic devices to administer and score Eysenck personality questionnaire which is softened and standardized to Iran community. Therefore, present study aimed to design and produce an electronic device to administer and score Eysenck personality questionnaire (for both adults and juniors) while it is normalized in accordance to Iran community. Reviewing and summarizing helpful points from the studies which used computer test versions, intended structure and output of the device were designed and, later, features and function of the device was compared to paper based test.

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