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The Effects of the Types of TOEFL (P&P vs. CBT) and Computer Anxiety Level on Iranian EFL Learners' Performance on TOEFL

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Abstract

This study was particularly concentrating on TOEFL type (CBT vs. P&P) and computer anxiety as independent variables, and test takers' performance as the dependent variable. The two TOEFL types (Paper-and-Pencil and Computer-Based) were given to 40 participants using counter balancing. The interval between the two tests was two weeks. The reason behind choosing this interval and counter balancing was to prevent the practice effect. Three days after the test, the computer anxiety questionnaire was also taken by the same participants. The results showed a high correlation between the scores on the two versions of the test (P&P vs. CBT), also there was no significant difference between the performances of t, and finally, there was no significant interaction between test type (P & high-, low-, and mid-anxious candidates on the two versions of the tesP vs. CBT) and computer anxiety level (high-anxious, low-anxious, and mid-anxious).

Key words: advanced EFL learners; P&P (Paper-and-Pencil test); CBT (Computer-Based Test); computer anxiety; computer anxiety scale

Introduction

Against the backdrop of developing computer use, the idea that computers could influence "the shape of minds to come" has considerable currency (Littleton & Hoyles, 2002) and much is being written about the potential of the computer in shaping new educational environments (Crook, 1994, 1996; Scimshaw, 1993; Littleton & Light, 1999; Chapelle, 2003). This enthusiasm for computer use in the classroom reflects in part recognition that life in the "information age"

will require everyone to be familiar and competent with computer technology.

The researches carried out on computer-assisted language learning show that learners most of the time have positive reactions towards using computers in classes (Reid, 1986; Neu & Scarcella, 1991; Phinney, 1991), and some studies investigated the effectiveness of computer-assisted language learning (Dunkel, 1991). But very few studies have been carried out in the area of computer-based language testing at least in our country.

The emergence of computer-based tests (CBTs) in high stakes test situations like TOEFL, the results of which have important effects on the future of test takers, has brought some important questions to the scene.

There are different reactions towards the use of computer-based version of the TOEFL. Some believe that computer itself has some effects on the performance on the test. Some others are of the view that test takers' attitudes and reactions towards computers and computer-based tests influence their performance on such tests. A few studies have been carried out in these areas and the results are controversial.

P&P vs. CBT Versions of TOEFL

Computer-based language tests are those that are administered on stand-alone computers without much modification from their paper-and-pencil versions. In the first generation of CBTs, item types like multiple-choice and true-false were simply moved from P & P versions to computers. Recently, however, more various types of CBTs have begun to appear. Nowadays CBTs can be designed to interactively test reading, writing, listening and speaking all at the same time (Brown, 2004).

"Advancing technologies have many potential ramifications for computer-assisted language testing" (Brown, 1997, p. 45). Brown (1992) mentioned some of the technological developments that may have an influence on language teaching and testing:

> Consider the multi-media combinations that will be available in the very near future: CD-ROM players working with video-image projectors, and computers controlling the whole interactive process between students and machines for situations and language tailored

> to each student's specific needs…. Consider the uses to which computer communications networks could be put. What about scanners and hand-writing recognition devices? Won't voice sensitive computers and talking computers be valuable tools in the language media services of the future? (p. 2)

The Computer-Based (CBT) version of the Test of English as a Foreign Language (TOEFL), which is administered throughout the world to evaluate the English proficiency of non-native speakers of English, was introduced July, 1998, in the United States, Canada, Latin America, Europe, Australia, Africa, the Middle East, and a limited number of Asian countries. In October, 2000, the CBT was introduced in all other Asian countries completing the worldwide phase-in of the CBT.

The introduction of the computer-based TOEFL inevitably raises questions version of the test (P & P) vs. the computer-based version of it (CBT). Some test takers, test givers, and test administrators "express the fear that computer delivery may influence test performance" (Chapelle, 2001, p. 95), they also believe the performances of test takers on the two versions are not the same and consequently they cannot be considered as equivalents. These questions and doubts are also increasing in Iran because the CBT version is gradually coming to the scene in this country, too.

Some other curiosities are about test takers' *reactions* to computer-based version of the TOEFL. This issue is important because such reactions may influence test takers' motivation and, in turn, performance on the test, thereby attenuating the test's validity. One of these reactions towards the computer-based version is test takers' reactions resulting from their computer anxiety.

Computer Anxiety

Computer anxiety as a psychological phenomenon has been questioned and studied over the past three decades. Computer anxiety is defined as an individual's fear or apprehension of working directly with a computer or fear of the anticipation of having to work with computers. Many researchers have identified computer anxiety in their studies (Cambre & Cool, 1985; Torkzadeh & Agulo, 1992). As Beckers and Schmidt (2003) mentioned, computer anxiety is manifested by physiological reactions such as sweaty palms, dizziness, and shortness of breath, and often these

reactions come along self-critical internal dialogue (Hemby, 1998; Weil, Rosen & Wugalter, 1990; Lalomia & Sidowski, 1993).

It is believed that understanding the nature of computer anxiety may help educators in minimizing the degree of its negative impact or in the selection of better remedial or even preventive treatments.

These statements show the nature of computer anxiety (Chua, Chen & Wong, 1999): 1) Computer anxiety is a fear of computers when using it or when thinking about the possibility of using it. 2) Computer anxiety is a kind of 'state anxiety' i.e., it can be changed and is not fixed forever. 3) Computer anxiety can be measured through various aspects: general computer anxiety, equipment anxiety, learning anxiety, computer observing anxiety etc. 4) Computer anxiety results in computer use avoidance. Therefore, computer anxiety is a kind of state anxiety that can be changed and measured along multiple dimensions.

Rosen and Weil (1995, 1996) believed computer anxiety to be endemic among groups such as public school teachers, students, and psychologists. They estimated that as many as 40% of the population in the US experience computer anxiety to a degree. In a large sample of first year university students from 23 countries, Rosen and Weil (1995) found the occurrence of computer anxiety to vary widely among different counrtries, e.g., Israeli students had a low of 12% and Indonesian students a high of 100% computer-related anxiety. Bozionelos (1997) showed that more than 20% of a sample of British managers and professionals had scores above the midpoint on a computer anxiety scale. With the increasing use of personal computers in business, education and home, the problem of computer anxiety has become more relevant. It is a controversial issue whether increasing Internet use and the emergence of technologies increase computer anxiety or enhance computer use (Beckers & Schmidt, 2003).

Beckers, Wicherts and Schmidt (2007) believed that suffering from such fear might result in computer avoidance and, hence, these people never acquire the skills necessary to be successful in the modern-world information age. The fear of performing poorly or be clumsy with the computer is central to computer anxiety. It is generally believed that the fear itself worsens performance; people who fear the computer may do worse on it because of this (Chou, 2001; Mahar, Henderson & Deane, 1997; Smith & Caputi, 2001; Reznich, 1996). Smith and Caputi (2001)

found that those high in computer anxiety were involved with more worry (i.e., self-preoccupation, concerns about personal ability) and off-task thoughts when using computers. They concluded that the negative effects of computer anxiety on performance may only occur because worry and other task-irrelevant thoughts interfere with the person's ability to process and store information relevant to the task at hand, especially when this task is complex or cognitively demanding. Other researchers found anxious users were slower in completing tasks, too (Mahar, Henderson & Deane, 1997; Reznich, 1996), and had a lower perception of their computer abilities (Chou, 2001). Rozell and Gardner (2000) investigated a path model of intrapersonal cognitive, motivational, and affective processes connected with computer-related performance among students who were formally instructed in word processing, spreadsheet use, and database management. Computer test performance was measured by the scores on three consecutive tests. Computer anxiety turned out to be negatively related to performance by influencing the students' judgments of their ability to utilize a computer and, therefore, the amount of effort put into the computer-related task. Laguna and Babcock (1997) found in a study among adults that older adults (age 55+) needed more time to complete a perceptual decision task on a computer and that computer anxiety was a significant covariate. However, some studies have shown that computer anxiety has little influence on test takers' test performance (Powers, 1999; Vispoel, Rocklin & Wang, 1994; Vogel, 1994). As the cited studies show, there are mixed findings regarding the effects of computer anxiety on test performance.

Some investigations on college students and adults showed that computer familiarity is related to acceptance and other attitudes about computers (Powers & O'Neill, 1993; Wilder, Mackie & Cooper, 1985), anxiety about computers (Kernan & Howard, 1990; Powers & O'Neill, 1993), and attitudes about computerized tests (Burke, Normand & Raju, 1987). Little is known about the relationship between computer anxiety and performance on computer-based tests (Stricker, Wilder & Rock, 2004).

This study tried to concentrate on the comparison of the performance of EFL learners on the two versions of TOEFL (P & P vs. CBT). In addition, it tried to investigate the effects of computer anxiety on the performance of test takers on the computer-based version of the test.

Clearly, research into this area is needed and finding the answers to some of the questions will be of theoretical and practical use.

To achieve the objectives of the study, three specific research questions were developed: 1) Is there any significant difference between the performances of the same Iranian English major test takers on the two types of the TOEFL (P & P vs. CBT) ? 2) Is there any relationship between the computer anxiety level (high-anxious, low-anxious, and mid-anxious) and the performance of the participants on the computer-based version of the TOEFL test? 3) Is there any interaction between the two types of the TOEFL and computer anxiety level of the participants?

Methodology

Participants

40 students who were majoring in English literature at Ershad University in Tehran participated in this study. They were the last semester English major students who were selected from two intact classes using cluster sampling procedure. The reason behind choosing these students was that they were considered advanced EFL learners who had the necessary knowledge to take TOEFL.

Instrumentation

P&P Version of the TOEFL

The paper-and-pencil version of the TOEFL consisted of three sections: listening, structure, and reading. The listening section consisted of 50 questions, the structure section 25, and the reading section 45 questions.

The reliability and validity of the test were checked before use. For this purpose the test was administered to 50 subjects who were similar to the ones in the real study. For estimating the reliability, the internal consistency was checked. The alpha was 0.96. To ensure the validity, criterion-related validity was used i.e., it was correlated with another placement test (OPT 1992) the reliability and validity of which were computed before by the researcher. The correlation between the two tests was estimated through Pearson Product-Moment formula. The result was 0.68 which was acceptable.

CBT Version of the TOEFL

The sections and questions in the computer-based version were exactly like the P & P version of the test. In other words, in this study two different versions (P & P vs. CBT) of the same test were utilized. This should have been done because the researchers wanted to compare the performance of the same subjects on the two versions so these two versions should have been exactly the same so that the presence of any kind of difference could not have been attributed to any other factor but test type i.e., P & P vs. CBT.

For the CBT each subject sat behind a stand-alone computer and answered the questions. As it is the case with CBT, the items could be seen on the screen only one at a time meaning that the test taker could not see the items unless answering the previous one. It is considered a drawback in CBT. On the upper part of the screen some pieces of information were shown which included: time, the name of the section (listening, structure, etc.), and the number of the question to be answered and the total number of questions in that section. After finishing each section an immediate feedback was given to the subjects by the computer. This feedback was in the form of identifying the correct and incorrect answers of each test taker in that section.

Computer Anxiety Scale

Many researchers suggested groups of items for measuring computer anxiety (Charlton & Birkett, 1995; Heinssen, Glass & Knight, 1987; Marcoulides, 1989; Rosen, Sears & Weil, 1987; Rosen & Weil, 1995; Simonson, Maurer, Montag-Toradi & Whitaker, 1987). Most of these sets share many items with each other. Rosen and Weil (1995) presented the most common group. This set is an improvement of the sets which were originally offered by Rosen, Sears and Weil (1987) and Marcoulides (1989).

Many investigations have been carried out on establishing computer anxiety scales (Cambre & Cook, 1985; Lalomia & Sidowsky, 1993; Dukes, Discenza & Couger, 1989; Harrison & Rainer, 1992; Meier & Lambert, 1991; Woodrow, 1991). These researches showed high reliability estimates and high correlations between these scales. They have also shown the existence of numerous correlates (Maurer, 1994). It should be mentioned that computer anxiety has been linked with the lack

of computer experience (Cohen & Waugh, 1989; Morrow, Prell & Elroy, 1986), gender (Lankford, Bell & Elias, 1994; Pope-Davis & Vispoel, 1993), age (Dyck & Smither, 1994; Rosen, Sears & Weil, 1987), personnel traits and other anxieties (Kernan & Howard, 1990; Marcoulides, 1989).

The scale used in this study was the computer anxiety subscale from BELCAT (Blombert-Erickson-Lowery Computer Attitude Task, Erickson, 1987). On the basis of the study carried out by Christensen and Knezek (2000), this subscale was found to exhibit high average alpha of 0.95.

This scale included 20 Likert scale questions ranging strongly agree (1) to strongly disagree (5) choices. This questionnaire was used to divide the participants to three major groups: high-, low- and mid-anxious.

The reliability and validity of the questionnaire were estimated by administering it to 280 subjects who were similar to the participants of this study. For reliability Cronbach alpha was used. The value of alpha was 0.88. For estimating the validity, factor analysis was used. It was exploratory factor analysis and the method was Principle axis factoring. The most important table in the output was the Rotated Component Matrix. The purpose of rotation was not to change the number of factors extracted, but to try to arrive at a new position for the axes (factors).

Three factors were extracted. Questions with high loadings on the first factor were: 2, 5, 7, 10, 11, 13, 15, 17, 18, and 20. These questions were all related to ***working and dealing with computers***. Questions with high loadings on the second factor were: 1, 3, 4, 6, 8, 12, 14, and 16. These questions were related to ***feelings and emotional reactions***. Questions with high loadings on factor three were only: 9 and 19 which seemed not to have been so much related nor were they enough (just two items) to be considered as a separate factor. Therefore, the researcher decided to omit questions 9 and 19. The questionnaire can be found in the appendix.

Procedure

The first part of the study was checking the reliability and validity of the computer anxiety scale. For this purpose, it was distributed among 280

subjects and then after carrying out the necessary statistical procedures the reliability and validity were estimated.

First, the P & P version was administered. Then, after an interval of two weeks the CBT version of the same test was administered to the same participants. To reduce practice effect or at least balance such effect the counter-balancing procedure was used in the sense that half of the participants took CBT first whereas the other half sat for the P & P first.

Three days after the test, the computer anxiety questionnaire was distributed among participants. The questionnaire was given after the two tests in order to prevent the probable effects of the questionnaire on the performance of the subjects in the two tests. On the basis of the scores of subjects in this questionnaire, and using standard deviation as the criterion, they were divided into three major groups concerning their computer anxiety level (high-anxious, low-anxious, and mid-anxious).

After collecting the whole data the necessary statistical procedures were carried out in the SPSS software.

Data analysis

The obtained data was analyzed using the SPSS (Statistical Package for Social Sciences) software. The statistical tests used were Person product moment correlation coefficient and two-factor mixed factorial ANOVA.

Results and Discussion

To check for the normality of the distribution of the two TOEFL scores before conducting the main analysis, a K-S test was used. The results are shown in Table 1.

Table 1

One-sample kolmogorov-smirnov test of the sample

	Paper-and-pencil test	Computer-based test
N	40	40
Kolmogorove-Smirnov Z	0.80	0.58
Asymp. Sig. (2-tailed)	0.55	0.89

As the p-values of 0.55 (for P & P) and 0.89 (for CBT) show, both TOEFL scores were normally distributed in the sample which means that the most important assumption of parametric statistical tests was met, hence the data could be used to test the performances.

Table 2 tabulates statistics for each version of the test.

Table 2

Descriptive statistics for CBT and P & P versions

	Mean	N	Std. Deviation
CBT scores of groups	65.08	40	20.86
P & P scores of groups	66.38	40	20.01

The means of the two versions were very close to each other (65.08 for P & P, and 66.38 for CBT).

Table 3 specifies the value of the correlation coefficient.

Table 3

Correlation between CBT and P & P versions

	N	Correlation	Sig.
CBT scores of groups & P & P scores of groups	28	0.84	0.00

The correlation between the two versions was 0.84 at p-value less than 0.05. It was a rather high correlation.

In order to compare the means of the three sub-parts of the two versions, three paired t-test were carried out. Table 4 shows the general statistics.

Table 4

Descriptive statistics for the three sub-parts of CBT and P & P versions

		Mean	N	Std. Deviation
1	CBT listening section	29.08	40	8.39
	P & P listening section	28.98	40	8.73
2	CBT structure section	14.8	40	3.85
	P & P structure section	14.8	40	5.18
3	CBT reading section	22.5	40	9.96
	P & P reading section	22	40	10.32

The means for each sub-part were very close to each other i.e., 29.08 and 28.98 for listening; 14.8 and 14.8 for structure; and 22.5 and 20 for reading.

Table 5 shows the correlations between the sub-parts.

Table 5

Correlation for the three sub-parts of CBT and P & P versions

		N	Correlation	Sig.
1	CBT listening section & P & P listening section	40	0.76	0.00
2	CBT structure section & P & P structure section	40	0.84	0.00
3	CBT reading section & P & P reading section	40	0.53	0.00

All three correlations were rather high with p-value less than 0.05 (0.76 for listening; 0.84 for structure; and 0.53 for reading). So there were high correlations between the two versions of the three sub-parts.

After collecting the questionnaires, the scores were assigned to participants on the basis of their performance on this computer anxiety questionnaire. Then, the mean and standard deviations were calculated. Table 6 shows the descriptive statistics.

Table 6

Descriptive statistics for the computer anxiety questionnaire

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Computer anxiety test	40	17	41	1043	26.08	6.83

To run two-way, we needed to have classified the participants into some groupings. Based on mean and SD, it was divided to three groups of high-, mid-, and low-anxious.

Those participants whose computer anxiety scores were half SD above and below the mean (-0.5 SD and +0.5 SD) were considered as mid-anxious. The mean was 26.08 and the SD was 6.83, half of which became 3.42. Those participants whose scores were 29.5 (26.08 + 3.42) and higher were considered high-anxious, and those whose scores were 22.65 (26.08 – 3.42) and lower were considered low-anxious, and those in the range of scores from 22.66 to 29.5 were considered mid-anxious.

The two-factor mixed factorial ANOVA was used in order to analyze the data. Table 7 shows the descriptive statistics.

In the CBT version of the test the mean score of the high-anxious group (62.92) was lower than those of the other two groups (67.27 for low-anxious, and 69 for mid-anxious). But are these similarities and differences significant? The following tables answer this question.

Table 7

Tests of within-subjects contrasts for the total scores

Source	df	Mean square	F	Sig.
Test type	1	34.45	0.51	0.48
Test type * Anxiety	2	51.58	0.76	0.47

Table 8

Tests of between-subjects effects for the total scores

Source	df	Mean square	F	Sig.
Intercept	1	342784.85	425.04	0.00
Anxiety group	2	74.22	0.09	0.91

Note that the factor 'test type' did not have any significant main effect ($p > .05$), meaning that the two versions of the test were not significantly different. The interaction of test type and anxiety was not significant either ($p > .05$). With a p-value more than .05, there was not any significant difference in performance among the three groups (high-, low-, and mid-anxious participants). Therefore, there was not a significant main effect for the anxiety level either. The profile plots confirm the results of the above tables, too.

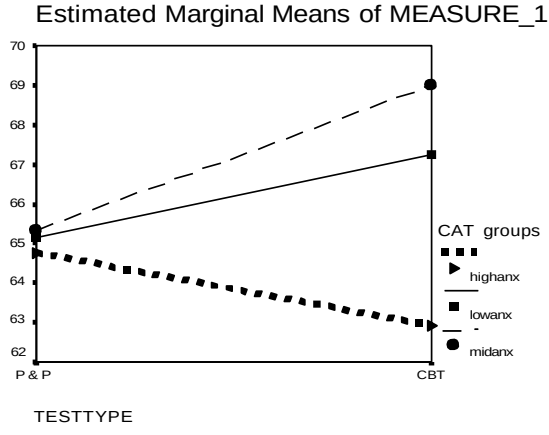

Figure 1. Profile Plots for the groups

The profile plots shows that the three lines were not crossing each other; therefore, there was no significant interaction between test type and anxiety groups. In the low-, and mid-anxious groups the mean scores on CBT were higher than P & P. On the contrary, in the high-anxious group the mean score on CBT was lower than P & P, but as the test showed these differences were not big enough to be considered significant.

The results of the analyses showed that all three null hypotheses were accepted. In other words, there was a very high correlation between the performances on the two versions of TOEFL. The medium of test delivery did not influence the performance on the test (the first null hypothesis). In addition, the computer anxiety level of the participants could not influence their performances on the computer-version of the test (the second null hypothesis). There was not any significant interaction between the two independent variables of TOEFL type and computer anxiety (the third null hypothesis).

The findings of the study agree with Powers (1999), Vispoel, Rocklin and Wang (1994) and Vogel (1994) who did not find a significant role for computer anxiety. In addition, the findings go hand in hand with Taylor, Krisch, Eignor and Jamieson (1999) who examined the relationship between computer familiarity and TOEFL scores. They claimed that no relationship was found between computer familiarity and performance on the computerized tasks after controlling for English language proficiency. They concluded that there was no evidence of bias against candidates with low computer familiarity. The same is true with respect to computer anxiety.

It seems that since CBTs are rather user friendly, even computer anxious candidates can handle the situation without big differences i.e. their anxiety did not hinder their performance on the CBT.

Another influential factor can be the participants' field of study. All of them were English majors, and their proficiency in English might have helped them overcome their computer anxiety to a greater extent compared to non-English majors.

These findings can be because of the levels of the participants who were advanced students studying at the university. These students had the opportunity to work on their English proficiency all during these terms at the university. In addition, they had the chance to work with computers during these terms because of different reasons e.g., carrying out searches, typing projects, etc.

Since the research was carried out with a small sample, this might be another factor influencing the results. Perhaps with a larger sample, the results differ. Also all participants were from Tehran, and mostly belonged to high-mid or high socio-economic levels in the society.

Conclusion

The use of computers and related technologies influences all areas of the daily life. Computers are not only the valuable sources of information but also have significant roles as assessment and feedback tools (McDonald, 2002).

Computers have much to offer to the field of language testing: not only for test delivery, but also for test construction, test compilation, test

scoring, results calculation and delivery, and test analysis. They can also be utilized for storing tests and details of candidates (Alderson, 1996).

But there are lots of questions regarding CBTs. These questions include: Are the two versions (P & P vs. CBT) like each other and can they be used interchangeably? Do computer anxious candidates perform worse than mid- or non-anxious ones on the computer version of the test?

The results of this study showed that there was a high correlation between the two versions of the test (P & P and CBT), every candidate that performed well on P & P also performed well on CBT. Therefore, no significant difference was found between P & P vs. CBT version of the TOEFL. This means that these two versions can be utilized interchangeably by the testing organizations.

The other finding of the study was that there was no significant main effect for the computer anxiety. There was not a significant difference among high-, low-, and mid-anxious participants‟ performances on the two versions of the test. In addition, there was not a significant interaction between these two factors (test type and anxiety group).

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Appendix
Computer Anxiety Questionnaire

Dear respondent, this questionnaire is for testing your feelings and reactions towards computers. Your precision adds to the validity of interpretations. Your answers are confidential.

Name: Age: Gender:

1: Completely agree 2. Agree 3. Neutral 4. Disagree 5. Completely disagree

1. Computers don't scare me at all.

1	2	3	4	5

2. Most things I can handle OK, but I have trouble working on computers.

1	2	3	4	5

3. I get a sinking feeling when I think of trying to do something hard with a computer.

1	2	3	4	5

4. A computer test would scare me.

1	2	3	4	5

5. I don't think I could do advanced computer programming; it sounds too hard for me.

1	2	3	4	5

6. I have a lot of self-confidence when it comes to using a computer.

1	2	3	4	5

7. I'm sure I could do advanced work- like a big programming project- on a computer.

1	2	3	4	5

8. I'm not the type to do well with a computer.

1	2	3	4	5

9. I am unsure of my ability to learn a computer programming language.

1	2	3	4	5

10. I have avoided computers because they are unfamiliar to me.

1	2	3	4	5

11. I have difficulty understanding most technological advances.

1	2	3	4	5

12. If given the opportunity to use a computer, I'm afraid I might damage it some way.

1	2	3	4	5

13. I feel apprehensive about using a computer terminal.

1	2	3	4	5

14. I am unsure of my ability to interpret a computer printout.

1	2	3	4	5

15. I hesitate to use a computer for fear of making mistakes I cannot correct.

1	2	3	4	5

16. I am usually uncomfortable when I have to use a computer.

1	2	3	4	5

17. I sometimes get nervous just thinking about computers.

1	2	3	4	5

18. I sometimes feel that computers are smarter than I am.

1	2	3	4	5