

Medical Student Use of Computers Correlates with Personality

John A. McNulty¹, Ph.D., Baltazar Espiritu², M.D., Martha Halsey³, M.S.

¹Department of Cell Biology, Neurobiology and Anatomy

²Department of Medicine

³Learning Assistance Center

Loyola University Stritch School of Medicine

Maywood, IL 60153 U.S.A.

Phone: (+)1-708-216-5161

Fax: (+)1-708-216-3676

E-mail: jmcnulty@lumc.edu

ABSTRACT

A recent study evaluating utilization of computer-aided instruction revealed a wide disparity among individual medical student use of computer resources. We tested the hypothesis that the frequency and length of medical student logins to the school's computer network correlated with their personality preferences. Personality preferences of students (n=236) were obtained using the Myers-Briggs Type Indicator (MBTI) test. Computer utilization was quantified from network logs that recorded frequency and length of logins to the network. Individual login data were sorted by personality preference and statistically analyzed. Students with personality preferences that included **I**ntroversion (vs. **E**xtraversion), **i**Ntuition (vs. **S**ensing), **T**hinking (vs. **F**eeling) and **P**erceiving (vs. **J**udging) tended to use computers the most. Groupings of preferences revealed that "**ITP**" types logged in significantly more often than "**EFJ**" types regardless of the **N/S** dimension. "**NTP**" types logged in for significantly longer time than the "**SFJ**" regardless of the **E/I** dimension. These results suggest that using computers is not a natural inclination for many students, which may account for the wide disparity in student use of computer-aided learning.

INTRODUCTION

Computer-aided instruction (CAI) and other technological resources are increasingly used in the medical curriculum,^{1,2} a trend that has accelerated with the development of Internet applications and the rapid distribution of curricular content through networks. However, a recent study evaluating utilization of web-based CAI in a basic science course revealed a wide disparity among individual medical student use of the computer resources that were developed to specifically facilitate instruction of the subject matter.³ Based on earlier reports that learning preferences are correlated with personality types,^{4,5} we hypothesized that the degree to which individual medical students use computer technologies is related to their personality preferences as measured by the Myers-Briggs Type Indicator (MBTI) test.

The MBTI is a widely accepted psychological instrument, and has been used extensively to examine the personality preferences of medical students with particular attention to specialty choices.⁶⁻⁹ Eight personality preferences are described within four separate dimensions. **E**xtraversion vs. **I**ntroversion is the dimension that measures whether one's preferred source of information is focused on the outside world or on the inner self. **I**Ntuition vs. **S**ensory is the dimension that measures whether an individual prefers to process information by focusing on the relationships between facts or the facts themselves. **F**eeling vs. **T**hinking is the

dimension that measures whether there is a preference for making decisions subjectively and personally or objectively and impersonally. The fourth dimension, **P**erceiving vs. **J**udging, discriminates those individuals whose preference is to be spontaneous and flexible from those whose preference is to be decisive and orderly. The MBTI reports a 4-letter code reflective of individual preferences in each dimension resulting in 16 distinct personality types (i.e., ENTJ or ISFP).

This report describes the results of a study correlating the personality preferences of freshman medical students as measured by the MBTI with how often and how long individual students logged into the school's computer network.

METHODS

Administration of the MBTI

All students matriculating at Loyola University Stritch School of Medicine (SSOM) were offered an opportunity to take the MBTI test through the Office of Learning Assistance. For administrative reasons, the MBTI test was not administered in 1999. The class size for each year equaled 130 students, although not all students elected to take the MBTI.

Login statistics

The study included network log data collected from two separate years (1998 and 2000) during the period when the first year medical students were enrolled in the Structure of the Human Body course. All the computer workstations in the medical school utilize the Windows NT 4.0 operating system, which requires students to log in before accessing the network. Data from each individual login were stored in an entry log. This log was used to construct a user database on the number of logins and length of each login for each student by date. Total login time for individual students was calculated by adding the time spent for each login.

All data were entered into Excel spreadsheets. Once the data for individual students were entered, the names of students were deleted from the database prior to further analyses in order to maintain the confidentiality of individual students.

Statistics

Means and standard deviations were calculated for each of the login variables and differences between means were evaluated by the Student's t-test. Differences between groupings of personality preferences were also compared by the Student's t-test. Analysis of variance (ANOVA) was used to test for effects of the 16 different personality types on each variable. Correlation coefficients were calculated by regression analyses.

RESULTS

The number of students who elected to take the MBTI was greater in 1998 (125/130) than in 2000 (111/130). Examination of the eight MBTI personality preferences in each year (Table 1) showed a reasonably consistent pattern with the majority of students exhibiting preferences for **Extroversion** (57-62%), **iNtuition** (59-61%), **Feeling** (58-62%), and **Judging** (66-71%). The most common of the 16 types in both years were ENFJ (12-17%) and ESFJ (12-14%).

The network entry logs revealed that the average number of logins was higher in 1998 compared to 2000 while the average length of each login was lower in 1998 compared to 2000 (Table 1). The total mean time that each student was logged into the network was greater in 2000 compared to 1998. However, none of these differences was significant (Student's t-test).

When each of the login variables was compared between personality preferences, the greatest differences occurred in the class of 1998 (Tables 2-4). Specifically, the **Introvert** and **Thinking** preferences had a significantly greater number of logins than the **Extrovert** and **Feeling** preferences, respectively, in 1998 (Table 2). The **Introverts** also had significantly shorter logins compared to the **Extroverts** in 1998 (Table 3). There were no significant differences in either year between any preferences for the total mean login time (Table 4).

Table 1. Means (\pm SEM) for login data in each year of the study. The number and percentages of students in the different personality preferences and individual types are also provided for each year.

	1998	2000
Number of logins	95.0 (\pm 4.0)	85.4 (\pm 3.5)
Hours per login	0.61 (\pm .04)	0.74 (\pm .07)
Total time (hours)	52.9 (\pm 3.5)	56.2 (\pm 3.8)
Extrovert	71 (57%)	69 (62%)
Introvert	54 (43%)	42 (38%)
iNtuition	76 (61%)	65 (59%)
Sensing	49 (39%)	46 (41%)
Feeling	72 (58%)	69 (62%)
Thinking	53 (42%)	42 (38%)
Perceiving	36 (39%)	38 (34%)
Judging	89 (71%)	73 (66%)
ENFJ	15 (12 %)	19 (17 %)
ENFP	11 (9 %)	10 (9 %)
ENTJ	13 (10 %)	8 (7 %)
ENTP	3 (2 %)	3 (3 %)
ESFJ	17 (14 %)	13 (12 %)
ESFP	2 (2 %)	4 (4 %)
ESTJ	9 (7 %)	10 (9 %)
ESTP	1 (1 %)	2 (2 %)
INFJ	9 (7 %)	6 (5 %)
INFP	10 (8 %)	11 (10 %)
INTJ	11 (9 %)	4 (4 %)
INTP	4 (3 %)	4 (4 %)
ISFJ	6 (5 %)	5 (5 %)
ISFP	3 (2 %)	1 (1 %)
ISTJ	9 (7 %)	8 (7 %)
ISTP	2 (2 %)	3 (3 %)

Analysis of variance (ANOVA) among the 16 different personality types was conducted for each login variable, but it did not reveal any significant effects, due to the large number of groups and the large variability among individuals in each group.

Consistent year-to-year trends of computer use associated with specific preferences (bolded numbers in Tables 2-4) suggested that login variables could be further sorted and analyzed based on groupings of preferences. For instance, when data for the average number of logins for both years were pooled, the "ITP" types logged in more frequently than the "EFJ" types (T-test, $p < 0.009$) regardless of the N/S dimension. Grouping and sorting of preferences for total login time showed that "NTP" types logged in for longer time (T-test, $p < 0.002$) than the "SFJ" regardless of the E/I dimension.

Table 2. Means (\pm SEM) for total number of logins for each personality preference by year and for both years combined. Significant differences between personality preferences were identified by the Student's t-test. Preferences where the mean values showed similar trends in 1998 and 2000 are bolded. N = number of students.

NUMBER OF LOGINS			
	1998	2000	Combined Years
Extrovert	87.9 (\pm 5.9) n = 71	84.8 (\pm 4.8) n = 69	86.3 (\pm 3.7) n = 140
Introvert	104.9 (\pm 6.2) * n = 54	86.9 (\pm 6.8) n = 42	97.5 (\pm 4.8) n = 96
iNtuition	95.1 (\pm 5.4) n = 76	86.6 (\pm 5.1) n = 65	91.4 (\pm 3.8) n = 141
Sensing	95.6 (\pm 7.1) n = 49	84.2 (\pm 6.1) n = 46	90.2 (\pm 4.7) n = 95
Feeling	86.7 (\pm 4.8) n = 72	84.2 (\pm 5.1) n = 69	85.5 (\pm 3.4) n = 141
Thinking	106.9 (\pm 7.5)** n = 53	87.9 (\pm 6.1) n = 42	99.9 (\pm 5.3)*** n = 95
Perceiving	104.1 (\pm 9.4) n = 36	86.1 (\pm 7.7) n = 38	95.0 (\pm 5.9) n = 74
Judging	91.3 (\pm 4.7) n = 89	85.3 (\pm 4.5) n = 73	88.9 (\pm 3.3) n = 162

* = $p < 0.05$ for **E** vs. **I** in 1998 ** = $p < 0.03$ for **F** vs. **T** in 1998 *** = $p < 0.02$ for **F** vs **T** for combined years.

Further examination of the combined data for both years suggested that those preferences that included the larger numbers of students (e.g., Feeling and Judging) were also those preferences that included students who tended to use computer technology more sparingly. This trend was confirmed by regression analysis of the number of students in each of the eight preferences and the average number of logins for students in those preferences (Fig. 1). Similar trends were observed when the number of students in each preference was correlated with the other variables (average length of login and total login time), but the correlation coefficients were not statistically significant for these variables.

DISCUSSION

The principal finding from this study is that the degree to which medical students use computers is related to personality preferences, defined by the MBTI classifications. The most consistent differences were between the logical, analytical Thinking types, who used computers more frequently than the compassionate, subjective Feeling types. The iNtuitive and Perceiving characteristics also contributed to the increased utilization of computer technology. This observation is in general agreement with Smith et al.¹⁰ who reported that iNtuitive-Thinking types of teachers were more likely to use technology than the Sensory-Feeling types. Francis et al.¹¹ described an inverse relationship between

Table 3. Means (\pm SEM) for number of hours per login for each personality preference by year and for both years combined. Significant differences between personality preferences identified by the Student's t-test. Preferences where the mean values showed similar trends in 1998 and 2000 are bolded. N = number of students.

HOURS PER LOGIN			
	1998	2000	Combined Years
Extrovert	0.71 (\pm 0.08) n = 71	0.73 (\pm 0.05) n = 69	0.72 (\pm 0.06) n = 140
Introvert	0.47 (\pm 0.04)* n = 54	0.81 (\pm 0.07) n = 42	0.61 (\pm 0.07) n = 96
iNtuition	0.66 (\pm 0.07) n = 76	0.80 (\pm 0.08) n = 65	0.72 (\pm 0.06) n = 141
Sensing	0.54 (\pm 0.06) n = 49	0.70 (\pm 0.09) n = 46	0.61 (\pm 0.06) n = 95
Feeling	0.58 (\pm 0.05) n = 72	0.64 (\pm 0.07) n = 69	0.61 (\pm 0.06) n = 141
Thinking	0.65 (\pm 0.09) n = 53	0.72 (\pm 0.07) n = 42	0.67 (\pm 0.06) n = 95
Perceiving	0.58 (\pm 0.08) n = 36	0.96 (\pm 0.09) n = 38	0.77 (\pm 0.11) n = 74
Judging	0.63 (\pm 0.06) n = 89	0.65 (\pm 0.05) n = 73	0.63 (\pm 0.04) n = 162

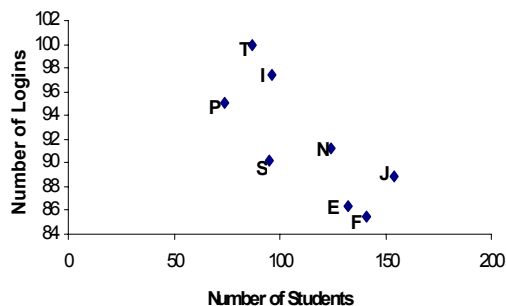
• = $p < 0.02$ for **E** vs. **I** in 1998.

more positive student attitudes toward computers and lower scores on the extraversion scale. Consistent with this observation is the present finding that Introvert types exhibited significantly greater number of logins compared to Extrovert types in 1998 with a similar tendency in the 2000 class.

Recent studies of several schools revealed that medical students tend to demonstrate stronger preferences for Extroversion, iNtuition and Judging,^{8,12} which is consistent with the findings in this study. However, SSOM students tended to have a preferred dimension of Feeling over Thinking, in contrast to other medical schools.^{9,12} This may reflect the type of student who attends a Catholic Jesuit medical school and is subsequently selected by the admissions committee, as was previously demonstrated for another medical school.¹² The Feeling-Thinking dimension is the only one reported linked to gender (females have predominantly Feeling preferences).¹³ Although the factor of gender was not included in the present analysis, the observation that 58-62% of SSOM students had Feeling preferences could not likely be entirely accounted for by gender since females comprised only 45% of both classes.

Differences in the overall use of computers between the class of 1998 and 2000 may have had potentially important confounding effects in the present study, especially when data for both years were pooled. Students in the 2000 class

Figure 1. Plot of number of students for each personality preference (1998 and 2000 combined from Table 1) vs. the mean number of logins for each personality preference (1998 and 2000 from Table 2). Regression analysis gave a $p = 0.028$.



See Table 1 for listing of abbreviations for personality preferences.

tended to login less frequently, but for longer periods of time than did students in the 1998 class. These differences may have been related to the increased amount of computer-aided instructional materials in the course as well as increased experience and familiarity of students with computers. It is intuitive that the level of confidence of medical students with computers is directly related to their attitude and use of computer-aided learning as previously demonstrated.¹⁴

The present study contrasts with some other studies that utilized questionnaires to obtain information on the participants' attitudes and preferences related to computer use.^{5,10,11,15} Assuming a direct correlation between the frequency/length of logins and positive attitudes toward computers, there are two important advantages for the use of network login data. First, it spreads the sampling of individuals over a longer period of time, to provide a better statistical measure of individual use. Second, it is a more objective measure of "attitudes" toward computers compared to subjective data obtained from questionnaires. The advantage of network entry logs was demonstrated recently in a study correlating computer-assisted learning with individual student comprehension of anatomy.³

CONCLUSION

The results of this study are particularly relevant to the application of computer-aided instruction in the medical curriculum because the data suggest that use of computers is not a natural inclination for a significant number of students. At SSOM, the majority of students exhibit MBTI preferences that predictably *would not* self-select activities involving CAI. This may account, in part, for the results from our previous study,³ where a relatively large number of SSOM students either did not use computer-aided learning materials at all, or used them only minimally. Accordingly, faculty who are considering implementing CAI extensively into their courses should consider one of the more established principles of teaching and learning – know your audience.¹⁶ In view of the increasing reliance of the

practice of medicine on technology, further studies are warranted to investigate the relationships between personality preferences and utilization of specific applications (e.g., tutorials, online discussion groups, electronic medical record, etc).

ACKNOWLEDGEMENTS

The authors wish to thank L. Grzywacz, R. Nahhedy and J. Corliss for their assistance with the analysis of the data and for secretarial help. Supported by the NIH/NLM (1 G08 LM06823-01) to JAMcN.

REFERENCES

1. Chodorow, S. Educators must take the electronic revolution seriously. *Academic Medicine* 1996; 71: 221-226.
2. Ward, J.P., Gordon, J., Field, M.J., and Lehmann, H.P. Communication and information technology in medical education. *Lancet* 2001; 357: 792-796.
3. McNulty, J.A., Halama, J., Dauszvardis, M.F., and Espiritu, B. Evaluation of web-based computer-aided instruction in a basic science course. *Academic Medicine* 2000; 75: 59-65.
4. Brinton, D.A., Jarvis, J.Q., and Harris, D.L. A small-group instruction experiment in medical education. *Journal of Medical Education* 1984; 59: 13-18.
5. Brudenell, I., and Carpenter, C.S. Adult learning styles and attitudes toward computer assisted instruction. *Journal of Nursing Education* 1990; 29: 79-83.
6. Brown, F., and Pepler, R.D. Changes in medical students' Myers-Briggs "preferences" between their first and fourth years of school. *Academic Medicine*, 1994; 69: 244.
7. Rezler, A.G., and Buckley, J.M. A comparison of personality types among female student health professionals. *Journal of Medical Education* 1977; 52: 475-477.
8. Stillwell, N.A., Wallick, M.M., Thal, S.E., and Burlison, J.A. Myers-Briggs type and medical specialty choice: a new look at an old question. *Teaching and Learning Medicine* 2000; 12: 14-20.
9. Wallick, M.M., and Cambre, K.M. Personality types in academic medicine. *Journal of Louisiana State Medical Society* 1999; 151: 378-382.
10. Smith, B., Munday, R., and Windha, R. Prediction of teachers' use of technology based on personality type. *Journal of Instructional Psychology* 1995; 22: 281-285.
11. Francis, L., Katz, Y., and Evans, T. The relationship between personality and attitudes towards computers: an investigation among female undergraduate students in Israel. *British Journal of Education Technology* 1996; 27: 164-170.
12. Wallick, M., Cambre, K., and McClugage, S. Does the admissions committee select medical students in its own image? *Journal of Louisiana State Medical Society* 2000; 152: 393-397.

13. Keirse, D. *Please Understand Me*, 3rd Ed., Prometheus Nemesis Book Co., Albany, NY, 1978.
14. Osman, L.M., and Muir, A.L. Computer skills and attitudes to computer-aided learning among medical students. *Medical Education* 1994; 28: 381-385.
15. Beauvois, M.H., and Eledge, J. Personality types and megabytes: student attitudes toward computer mediated communication (CMC) in the language classroom. *CALICO Journal* 1995; 13: 27-45.
16. Irby, D.M. What clinical teachers in medicine need to know, *Academic Medicine* : 1994; 69: 333-342.