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ABSTRACT

A study examined the job-entry typewriting speeds of all 185 secretaries employed at East Tennessee State University, which was selected as an institution representative of large public universities with a college of medicine. The secretaries' scores on the timed typing test that they took at the time of their application for their present positions (in one of three secretarial levels) served as the study data set. The mean of all 185 secretaries' typing test scores was calculated as 61 with a standard deviation of 11.87 and a range of 28 to 99 words per minute (wpm). The typing test scores of the secretaries employed at the college of medicine were compared to those of the secretaries employed throughout the other parts of the university. When the typing test scores of the three levels of secretaries were examined together, no statistically significant difference between the typing scores of the secretaries employed at the college of medicine and those employed elsewhere in the university was found. The mean typing rate of the level 2 secretaries employed at the college of medicine (56 wpm) was lower than that of the level 2 secretaries employed elsewhere in the university (61 wpm), however. Seven figures provide descriptive statistics. (Contains 12 references.) (MN)

Job-Entry Typewriting Speeds of Three Different Levels of Secretaries at a Large Public University

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Running head: JOB-ENTRY TYPEWRITING SPEEDS

Abstract

The purpose of this study was to determine job-entry typewriting speeds of secretaries employed at different secretarial levels in a large, public university. Typewriting speeds of all (185) secretaries at three levels at a large, public university with a college of medicine were identified using their timed writing scores upon application to the university. The mean of all typewriting scores was 61 with a standard deviation of 11.87 and a range from 28 to 99 words per minute (wpm). There was no statistically significant difference found in the typewriting scores of the three levels of secretaries. There was also no statistically significant difference found between the typewriting scores of the university secretaries and the college of medicine secretaries. The most interesting result was found in the mean (61) of the typewriting scores of the university secretaries at level 2 and the mean (56) of the typewriting scores of the college of medicine secretaries at level 2.

Job-Entry Typewriting Speeds of Three Different Levels of Secretaries at a Large Public University

There is no doubt that technology is changing our work force and work place. The 1960s were known as the decade of data processing, the 1970s dawned word processing and the 1980s gave us information processing. The 1990s will be the era of voice processing as voice mail and related technologies have come into their own in this decade.

As this workplace revolution accelerates in the 90s, the role of the secretary is metamorphosing as well. Professional secretaries are shedding their stenopads for "laptops" and replacing interoffice memos with electronic mail. Secretaries are using shorthand less while keyboarding is becoming a vastly important and highly valued office skill. Keyboarding is defined "as the act of placing information into the computer through the use of a typewriter-like keyboard, involving the placement of fingers on designated keys on the middle 'home' row of the keyboard and moving fingers as needed to depress other keys. This method is in contrast to hunt-and-peck typing" (Wentling,

1988, p. 30). Secretaries are also using a multitude of software programs to perform word processing, spreadsheet manipulation, desktop publishing and electronic data base management functions and activities.

With this migration to microcomputers and their appearance on virtually every office worker's desk, keyboarding skills have emerged as a highly valued office skill. Even with the technolcgical advances that are being made in such areas as optical-character recognition, voice recognition, and pen-based computing, the fingertips still remain the primary means of data entry in the foreseeable future (Ober, 1993).

In surveys of newspaper help-wanted ads from 1985 to 1987 requests for secretaries specifying use of computers or word processors steadily increased (Fusselman, 1987). The top two most-requested skills from surveys in both 1991 and 1992 were computer skills and word processing skills (Leland, 1992).

Keyboarding skills have become a primary means of basic communication. To utilize keyboarding skills

efficiently the office professional should acquire a keyboarding skill that incorporates both speed and, accuracy. "For employment purposes, most testing situations involve speed and accuracy at the keyboard. If job applicants cannot pass this timed writing, they will never even get an opportunity to demonstrate their higher-level word processing skills" (Ober, 1993, p. 37).

The most requested typing speeds have averaged from 60 to 66 wpm (words per minute) consistently over the past ten years (Fusselman, 1988; Leland, 1992). Therefore a study designed to identify the actual typing speeds of entry level office professionals would provide a basis to update and/or develop curricula for teaching keyboarding office systems programs. Also, the study would provide data for comparing actual job entry typing speeds of secretaries to those requested by employers.

Literature Review

By 1995, 95% of what we know will be stored in computers and the way to learn and communicate that knowledge will be by operating a computer. Tasks that

were formerly manual operations have now become automated through the use of various kinds of equipment that use a keyboard for data entry manipulation (Work, 1988). It is also expected that by the turn of the century that 90% of the workforce will occupy positions in offices.

We have without a doubt entered the Information Age as futurists have predicted and a new office professional has emerged with new job responsibilities as well. Today's professional secretary is not only expected to be proficient in traditional areas--managing records, handling mail, answering telephones, making appointments, scheduling meetings, keyboarding, and producing documents--but he or she will also be expected to master word processing and spreadsheet software, supervise decision making activities, manage part of the company budget, and demonstrate professional behaviors.

Some skills such as shorthand are on the decrease while the demand for computer skills in secretaries is higher than ever. In a 1992 survey of newspaper want ads from 17 major cities throughout the United States

and Canada conducted by The Dartnell Corporation's Institute of Business Research and From Nine To Five, a Dartnell publication, ad requests for specific hardware/software knowledge jumped to 40.2 percent from 29.2 percent in the preceding year (Leland, 1992).

Sophisticated computer software is changing the way people work in automated offices. With the proliferation of computer systems keyboarding is becoming an increasingly important skill for office workers at all levels. USA Today (Work, 1988) reported that the ability to use computers to perform everyday tasks will be the most important job skill for the 1990s, according to more than 100 personnel managers surveyed by a Chicago outplacement firm.

Business professionals as well as office professionals are finding that they must develop basic keyboarding skills so they can use computers efficiently. "If spreadsheets and databases have already improved the decision-making and budget/forecasting processes for business professionals who hunt-and-peck at the keyboard, touch-keyboarding

skills will further speed up the operation and enhance the results" (Wentling, 1992, p. 30).

Higgins study (as cited in Wentling, 1992) indicated that touch typists have a significantly higher production rate than hunt-and-peck typists. There is obvious speed improvement associated with touch-keyboarding over hunt-and-peck typing.

> Ten fingers will get data on the monitor faster than two fingers will. The error reduction associated with touch-keyboarding results for the fact that people see what they are inputting. Errors are noticed as they happen and can be corrected immediately. With hunt-and-peck, the errors will not be seen immediately, because the person is watching the keys rather than the screen most of the time and will have to look for the errors later--when they will be more difficult to find (Wentling, 1992, p. 30).

To be ready for the 21st century secretaries will need to reshape their perceptions of their positions in the workforce and seek training that will allow them to meet the challenges ahead. Research indicates that

today's workers expect their career paths to include upward movement. It also indicates that workers can look forward to increasing salaries and job responsibilities. As positions become more responsible the secretarial image will improve, but due to the developing low skill/low pay and high skill/high pay dichotomy individuals will have to choose a specific career.

The 1989 Professional Secretaries International (PSI) Office Occupations Model Curriculum for Secondary Business Education (Fenner, 1989) outlines recommended courses and their sequence for office administration, secretarial/clerical, accounting, business management, and college bound. The core sequence outlines the required courses for students choosing business as a study area or wanting to be computer literate. They are also considered prerequisites to all subsequent office administration courses. It is important to point out that the beginning course for all the course sequences and the core sequence alike is the keyboarding course.

Keyboarding is still the heart of all business programs and is emerging as a general basic skill for all students. Formal keyboarding is even now being included in the elementary curriculum, because students in early grades are utilizing computers. The recommended guideline being adopted by several states is: "Keyboarding should be taught before the skills are applied" (Jackson, 1991, p. 20).

A survey (Jackson, 1991) of Minnesota elementary schools found the most frequent level for beginning instruction was grade five. A Model for Restructuring Vocational Education (Poole & Zahn, 1989) places the keyboarding and computer applications course in the sixth grade with continuing courses in the middle grades. With introductory courses being taught in the early and middle grades, this allows students the opportunity to take more advanced business courses in high school and educators to better prepare them for the workplace.

Post secondary office administration programs are being revised and updated as well. The Office Administration and Business Education Department at

Northern Michigan University found the need for greatest change in their office administration program (Godell, 1992). Again the keyboarding course is the beginning course in the sequence of courses.

It is important to note that skill building should be emphasized in all introductory and advanced keyboarding courses. Straight-copy keyboarding skill is even more important today because of computers and the techniques of word processing. For example, when typing a report with footnotes a typist used to have to stop and insert pencil notations. Now with the use of word processing software the decision-making process is more automated. Typists can spend more of their time keystroking.

In a business survey (Dickman, 1989) measuring the need for entry-level office skills keyboarding/typing accuracy was rated by all business types as the most important of all the computer skills and general office skills.

From 1982 to 1989 annual surveys concerning secretarial positions were conducted by The Secretary and sponsored by Professional Secretaries International

Research and Education Foundation using newspaper ads from cities across the U.S. and Canada. The largest percentage of ads consistently gave a requirement speed between the 60-69 wpm (words per mir te) range. Closely following was the second largest percentage requirement speed ranging between 50 and 59 wpm. By 1989 most ads requested typing speeds in the 60 to 80 wpm categories and a few sought those who could type up to 100 wpm. Word processing ads required the highest typing speed at 70 wpm or more. Executive secretary ads and administrative secretary ads closely followed.

The percentage of ads requiring shorthand, fast notetaking or secretarial skills (which implies shorthand) continued to steadily decline each year. The percentage of ads mentioning these skills were 33.0% in 1985, 26.1% in 1986, 22.6% in 1987, 20,3% in 1988, and 13.8% in 1989. Notably also in 1989 one-third of the executive secretary titles still requested shorthand, down sharply from 1988's 51.5 percent. On the other hand, the percentage of ads requesting word processing or computer skills increased steadily from

1985 to 1989: 22.9% in 1984, 30.3% in 1985, 38.9% in 1986, 41.8% in 1987, 44.0% in 1988, 62.3% in 1989.

There is also an increasing trend for employers to seek secretaries with previous computer experience and training. They are less willing to train and cross train. This indicates that most employers are demanding that secretaries have some hands-on knowledge of computers before they are hired. Computer skills are fast becoming a key factor in secretarial hiring decisions.

In the surveys (Leland, 1992) conducted by The Dartnell Corporation's Institute of Business Research and From Nine to Five typing speeds averaged 61 wpm (words per minute) and the top two requested skills were: computer, 66.8 percent and word processing, 52.9 percent. The legal field led in the source of secretarial positions; followed by the health/medical field, financial industry, manufacturing/utility, nonprofit organizations, service, real estate, engineering/architecture/construction, sales/marketing and lastly personnel/human resources.

Program-specific skills increased and were mentioned in 40.2 percent of the ads. The preferred word processing software was WordPerfect® at 81.4 percent followed by Microsoft® Word™ at 8.6 percent. Lotus® 1-2-3® was the preferred spreadsheet software at 95% followed by Excel at 3.7%. Desktop publishing and database expertise remained at a low priority but those secretaries who acquire these skills will have the competitive advantage in the future.

With new software programs flooding the market and continual upgrades on existing programs secretarial professionals must continue to refine and update their technical skills. Expanding their repertoire of software programs and computer skills will keep them poised for the future and give them that competitive edge as they enter the twenty-first century.

Problem Statement/Hypotheses

The purpose of this study was to determine job-entry typewriting speeds of persons employed at different secretarial levels in a large, public university. The typing speeds of different "levels" of secretaries were compared. Also, comparisons were made

between the typing speeds of university secretaries and college of medicine secretaries. The literature suggests that a minimum typing speed of 50 words per minute (wpm) or higher is required and a typing speed of 60 to 70 wpm is preferred by most employers. No research was found on studies of actual job-entry typing speeds of secretaries hired. Thus, this study helped fill this research void.

The following hypotheses were formulated to test the data collected:

Null Hypothesis I: There is no difference between the typing scores of the three levels of secretaries at a large, public university.

Null Hypothesis II: There is no difference between the typing scores of the university secretaries and the college of medicine secretaries at a large, public university with a college of medicine.

Delimitations

It should be noted that before 1980 applicants may or may not have used the same timed writing tests and

the same equipment (an IBM Selectric typewriter) as have been utilized after 1980.

Method

Subjects

East Tennessee State University was used as representative of a large, public university with a college of medicine. The subjects for this study were the three levels of secretaries at East Tennessee State University: secretary 1, secretary 2, and secretary 3. Each level was subdivided into university secretaries and college of medicine secretaries.

Materials

Timed writing tests administered by the Department of Human Resources at East Tennessee State University (ETSU) were used to determine each secretary's job-entry typing speed. Applicants take two 3 minute timed writing tests and the better of the two scores is used as the recorded typing speed which is documented on the front of their ETSU application.

Variables

Three variables were used in this study. One was the dependent variable, typing speeds. The remaining

two variables were the independent variables, secretarial level and college division.

Design and Procedure

The design of this study was causal-comparative. The university's computerized report, "Staff By Job Title - 1993" was used to determine all employees who were in the position classified as secretary. The same report was also utilized to determine the level of the secretary: secretary 1, secretary 2, or secretary 3; and the division of the college: university secretary or college of medicine secretary. Typing speeds were then gathered on each secretary.

Results

There were 185 secretaries identified of which 184 were female and 1 was male. Of the 141 university secretaries, 19 were at level 1, 102 were at level 2 and 20 were at level 3. Of the 44 college of medicine secretaries 1 was at level 1, 25 were at level 2 and 18 were at level 3.

Typing speeds of the total group ranged from 28 to 99 wpm with the mean being 61 and a standard deviation

of 11.87. (To view typing speed dispersements see the histograms in Figures 1, 2, 3, 4, 5, & 6.)

A two-way ANOVA was used to analyze the variance and test the null hypotheses. The test failed to reject both null hypotheses. There is no statistically significant difference between the typing speeds of the three levels of secretaries. ($F= 1.54$, $df= 2$, $p=.2166$) There is also no statistically significant difference between typing speeds of the university secretaries and the college of medicine secretaries. ($F=.02$, $df=1$, $p=.8905$) (See Figure 7).

Discussion

Although there was no statistically significant difference reported on either null hypothesis, the research still produced other noteworthy statistics. The results of the research showed that secretaries were hired in at an average typing speed of 62 wpm, which is in line with the typing speed business educators expect students to reach and employers prefer to hire secretaries at.

Further research could be conducted on the same data to determine if variables such as number of typing errors, years of education, degree, gender or race had significance.

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FIGURE 1

----------Descriptive Statistics----------

Date/Time 07-13-1994 20:51:43
Data Base Name A:typscore
Description Data base created at 18:29:03 on 07-07-1994

Detail Report

Variable: TYPING SPEEDS (ALL SECRETARIES)

Mean - Average	61.04268	No. observations	185
Lower 95% c.i.limit	59.21224	No. missing values	21
Upper 95% c.i.limit	62.87312	Sum of frequencies	164
Adj sum of squares	22970.7	Sum of observations	10011
Standard deviation	11.87116	Std.error of mean	.9269822
Variance	140.9245	T-value for mean=0	65.85098
Coef. of variation	.1944732	T prob level	0.0000
Skewness	.2389174	Kurtosis	.6778817
Normality Test Value	1.049691	Reject if > 1.033(10%)	1.052(5%)
K.S. Normality Test	0.04808	Reject if > 0.063(10%)	0.070(5%)

√b1 0.24 Skew-Z 1.27 Pr 0.2028 b2 3.62 Kurt-Z 1.62 Pr 0.1061
D'Agostino-Pearson Omnibus K² Normality Test 4.2 Pr 0.1204

100-%tile (Maximum)	99	90-%tile	75
75-%tile	68	10-%tile	48
50-%tile (Median)	61	Range	71
25-%tile	53	75th-25th %tile	15
0-%tile (Minimum)	28	C.L. Median(95%)	58, 64

28----------Line Plot / Box Plot----------99
1 1 1 11 1131 11313A437 6544A353A1 8673551533 532 1 125 1 1 1 1
-----[XXXXXXXXmXXXXXXX]--------

Distribution & Histogram

Variable: TYPING SPEEDS (ALL SECRETARIES)

Bin	Lower	Upper	Count	Prcnt	Total	Prcnt	Histogram
1	28	32.17647	2	1.2	2	1.2	:*
2	32.17647	36.35294	1	0.6	3	1.8	:*
3	36.35294	40.52941	3	1.8	6	3.7	:**
4	40.52941	44.70588	5	3.0	11	6.7	:***
5	44.70588	48.88236	6	3.7	17	10.4	:***
6	48.88236	53.05882	27	16.5	44	26.8	:***************
7	53.05882	57.23529	19	11.6	63	38.4	:**********
8	57.23529	61.41177	21	12.8	84	51.2	:**********
9	61.41177	65.58824	25	15.2	109	66.5	:**********
10	65.58824	69.76471	20	12.2	129	78.7	:**********
11	69.76471	73.94118	12	7.3	141	86.0	:******
12	73.94118	78.11765	11	6.7	152	92.7	:******
13	78.11765	82.29412	8	4.9	160	97.6	:****
14	82.29412	86.47059	1	0.6	161	98.2	:*
15	86.47059	90.64706	0	0.0	161	98.2	:
16	90.64706	94.82353	1	0.6	162	98.8	:*
17	94.82353	99	2	1.2	164	100.0	:*

FIGURE 2

----------Descriptive Statistics----------

Date/Time 07-13-1994 20:52:37
Data Base Name A:typscore
Description Data base created at 18:29:03 on 07-07-1994

Detail Report

Variable: TYPING SPEEDS
Filter: SEC = 1 (ALL SECRETARIES AT LEVEL 1)

Mean - Average	61.68421	No. observations	20
Lower 95% c.i.limit	55.79248	No. missing values	1
Upper 95% c.i.limit	67.57594	Sum of frequencies	19
Adj sum of squares	2690.105	Sum of observations	1172
Standard deviation	12.22499	Std.error of mean	2.804604
Variance	149.4503	T-value for mean=0	21.99391
Coef. of variation	.1981866	T prob level	0.0000
Skewness	-.8852027	Kurtosis	1.92026
Normality Test Value	1.145874	Reject if > 1.227(10%)	1.381(5%)
K.S. Normality Test	0.12128	Reject if > 0.181(10%)	0.198(5%)
√b1 -0.81 Skew-Z	-1.70 Pr 0.0897	b2 4.15 Kurt-Z	1.66 Pr 0.0969
D'Agostino-Pearson Omnibus K² Normality Test		5.6	Pr 0.0597
100-%tile (Maximum)	81	90-%tile	75.5
75-%tile	72	10-%tile	49
50-%tile (Median)	61	Range	53
25-%tile	56	75th-25th %tile	16
0-%tile (Minimum)	28	C.L. Median(95%)	56, 72

28----------Line Plot / Box Plot----------81
1 1 1 1 2 2 1 12 1 1 11 1 1 1
----------[XXXXXXXmaXXXXXXXXXXXXXX]-----

Distribution & Histogram

Variable: TYPING SPEEDS Filter: SEC = 1

Bin	Lower	Upper	Count	Prcnt	Total	Prcnt	Histogram
1	28	33.3	1	5.3	1	5.3	:*
2	33.3	38.6	0	0.0	1	5.3	:
3	38.6	43.9	0	0.0	1	5.3	:
4	43.9	49.2	1	5.3	2	10.5	:*
5	49.2	54.5	2	10.5	4	21.1	:**
6	54.5	59.8	4	21.1	8	42.1	:****
7	59.8	65.10001	4	21.1	12	63.2	:****
8	65.10001	70.4	1	5.3	13	68.4	:*
9	70.4	75.7	4	21.1	17	89.5	:****
10	75.7	81	2	10.5	19	100.0	:**

FIGURE 3

----------Descriptive Statistics----------

Date/Time 07-13-1994 20:53:03
Data Base Name A:typscore
Description Data base created at 18:29:03 on 07-07-1994

Detail Report

Variable: TYPING SPEEDS
Filter: SEC = 2 (ALL SECRETARIES AT LEVEL 2)

Mean - Average	60.36364	No. observations	127
Lower 95% c.i.limit	58.03189	No. missing values	17
Upper 95% c.i.limit	62.69538	Sum of frequencies	110
Adj sum of squares	16595.46	Sum of observations	6610
Standard deviation	12.33904	Std.error of mean	1.176481
Variance	152.2519	T-value for mean=0	51.30863
Coef. of variation	.2044118	T prob level	0.0000
Skewness	.6074175	Kurtosis	.9002913
Normality Test Value	1.122791	Reject if > 1.047(10%)	1.073(5%)
K.S. Normality Test	0.08992	Reject if > 0.077(10%)	0.085(5%)
√b1 0.60 Skew-Z	2.55 Pr 0.0108	b2 3.81 Kurt-Z	1.71 Pr 0.0869
D'Agostino-Pearson Omnibus K^2 Normality Test		9.4	Pr 0.0090
100-%tile (Maximum)	99	90-%tile	75.5
75-%tile	66	10-%tile	47
50-%tile (Median)	59	Range	68
25-%tile	53	75th-25th %tile	13
0-%tile (Minimum)	31	C.L. Median(95%)	57, 62

31----------Line Plot / Box Plot----------99
1 1 1 11 21 113 1192155 4247232 7175323 1 21132 1 1 5 1 1 1 1
-------[XXXXXXmXaXXXXX]-----------

Distribution & Histogram

Variable: TYPING SPEEDS Filter: SEC = 2

Bin	Lower	Upper	Count	Prcnt	Total	Prcnt	Histogram
1	31	35.25	2	1.8	2	1.8	:**
2	35.25	39.5	1	0.9	3	2.7	:*
3	39.5	43.75	5	4.5	8	7.3	:*****
4	43.75	48	5	4.5	13	11.8	:*****
5	48	52.25	14	12.7	27	24.5	:**************
6	52.25	56.5	16	14.5	43	39.1	:***************
7	56.5	60.75	16	14.5	59	53.6	:***************
8	60.75	65	17	15.5	76	69.1	:****************
9	65	69.25	14	12.7	90	81.8	:**************
10	69.25	73.5	4	3.6	94	85.5	:****
11	73.5	77.75	6	5.5	100	90.9	:******
12	77.75	82	1	0.9	101	91.8	:*
13	82	86.25	6	5.5	107	97.3	:******
14	86.25	90.5	0	0.0	107	97.3	:
15	90.5	94.75	1	0.9	108	98.2	:*
16	94.75	99	2	1.8	110	100.0	:**

FIGURE 4

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------------------------------Descriptive Statistics-----------------------------
Date/Time        07-13-1994  20:53:26
Data Base Name A:typscore
Description      Data base created at 18:29:03 on 07-07-1994

                              Detail Report

Variable: TYPING SPEEDS
 Filter: SEC = 3  (ALL SECRETARIES AT LEVEL 3)
Mean - Average          62.82857      No. observations          38
Lower 95% c.i.limit     59.33588      No. missing values        3
Upper 95% c.i.limit     66.32127      Sum of frequencies        35
Adj sum of squares      3514.971      Sum of observations       2199
Standard deviation      10.16767      Std.error of mean         1.71865
Variance                103.3815      T-value for mean=0        36.55693
Coef. of variation      .1618319      T prob level              0.0000
Skewness               -.6555548      Kurtosis                 -7.700534E-02
Normality Test Value    1.067252      Reject if >  1.129(10%)   1.197(5%)
K.S. Normality Test      0.13673      Reject if >  0.136(10%)   0.149(5%)
√b1   -0.63 Skew-Z   -1.66 Pr 0.0972  b2    2.77 Kurt-Z    0.12 Pr 0.9050
D'Agostino-Pearson Omnibus K² Normality Test       2.8      Pr 0.2509
100-%tile (Maximum)    80             90-%tile                  74
 75-%tile              70             10-%tile                  50
 50-%tile (Median)     66             Range                     43
 25-%tile              54             75th-25th %tile           16
  0-%tile (Minimum)    37             C.L. Median(95%)    59, 69
37---------------------------Line Plot / Box Plot-----------------------------80
1        1          1 12 1 1 1 1    1 1 1  1   1 1 41 2 3 1 21 1 2        1   1
                        -------[XXXXXXXXXXXXXXaXXXXXmXXXXXX]-------
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Distribution & Histogram

Variable: TYPING SPEEDS Filter: SEC = 3

Bin	Lower	Upper	Count	Prcnt	Total	Prcnt	Histogram
1	37	40.58333	1	2.9	1	2.9	:*
2	40.58333	44.16667	1	2.9	2	5.7	:*
3	44.16667	47.75	0	0.0	2	5.7	:
4	47.75	51.33333	4	11.4	6	17.1	:****
5	51.33333	54.91666	3	8.6	9	25.7	:***
6	54.91666	58.5	2	5.7	11	31.4	:**
7	58.5	62.08333	3	8.6	14	40.0	:***
8	62.08333	65.66666	2	5.7	16	45.7	:**
9	65.66666	69.25	10	28.6	26	74.3	:**********
10	69.25	72.83333	4	11.4	30	85.7	:****
11	72.83333	76.41666	3	8.6	33	94.3	:***
12	76.41666	80	2	5.7	35	100.0	:**

FIGURE 5

----------Descriptive Statistics----------

Date/Time 07-13-1994 20:54:17
Data Base Name A:typscore
Description Data base created at 18:29:03 on 07-07-1994

Detail Report

Variable: TYPING SPEEDS
Filter: COLLEGE = 1 (ALL UNIVERSITY SECRETARIES)

Mean - Average	61.52	No. observations	141
Lower 95% c.i.limit	59.3459	No. missing values	16
Upper 95% c.i.limit	63.6941	Sum of frequencies	125
Adj sum of squares	18701.2	Sum of observations	7690
Standard deviation	12.28072	Std.error of mean	1.098421
Variance	150.8161	T-value for mean=0	56.00766
Coef. of variation	.1996216	T prob level	0.0000
Skewness	.2253712	Kurtosis	.7651082
Normality Test Value	1.060747	Reject if > 1.042(10%)	1.066(5%)
K.S. Normality Test	0.05363	Reject if > 0.072(10%)	0.080(5%)
√b1 0.22 Skew-Z	1.06 Pr 0.2895	b2 3.69 Kurt-Z	1.60 Pr 0.1095
D'Agostino-Pearson Omnibus K^2 Normality Test		3.7	Pr 0.1586
100-%tile (Maximum)	99	90-%tile	75
75-%tile	68	10-%tile	48
50-%tile (Median)	62	Range	71
25-%tile	53	75th-25th %tile	15
0-%tile (Minimum)	28	C.L. Median(95%)	58, 64

28----------Line Plot / Box Plot----------99
1 1 1 1 1 21 11212A 26 3433714381 656343 332 532 24 1 1 1 1
-----[XXXXXXXXXmXXXXXX]--------

Distribution & Histogram

Variable: TYPING SPEEDS Filter: COLLEGE = 1

Bin	Lower	Upper	Count	Prcnt	Total	Prcnt	Histogram
1	28	32.4375	2	1.6	2	1.6	:**
2	32.4375	36.875	1	0.8	3	2.4	:*
3	36.875	41.3125	2	1.6	5	4.0	:**
4	41.3125	45.75	4	3.2	9	7.2	:****
5	45.75	50.1875	16	12.8	25	20.0	:****************
6	50.1875	54.625	11	8.8	36	28.8	:**********
7	54.625	59.0625	18	14.4	54	43.2	:******************
8	59.0625	63.5	16	12.8	70	56.0	:****************
9	63.5	67.9375	20	16.0	90	72.0	:********************
10	67.9375	72.375	13	10.4	103	82.4	:************
11	72.375	76.8125	12	9.6	115	92.0	:**********
12	76.8125	81.25	2	1.6	117	93.6	:**
13	81.25	85.6875	5	4.0	122	97.6	:*****
14	85.6875	90.125	0	0.0	122	97.6	:
15	90.125	94.5625	1	0.8	123	98.4	:*
16	94.5625	99	2	1.6	125	100.0	:**

FIGURE 6

----------Descriptive Statistics----------

Date/Time 07-13-1994 20:55:03
Data Base Name A:typscore
Description Data base created at 18:29:03 on 07-07-1994

Detail Report

Variable: TYPING SPEEDS
Filter: COLLEGE = 2 (COLLEGE OF MEDICINE SECRETARIES)

Mean - Average	59.51282	No. observations	44
Lower 95% c.i.limit	56.12532	No. missing values	5
Upper 95% c.i.limit	62.90032	Sum of frequencies	39
Adj sum of squares	4149.744	Sum of observations	2321
Standard deviation	10.45006	Std.error of mean	1.673349
Variance	109.2038	T-value for mean=0	35.5651
Coef. of variation	.1755935	T prob level	0.0000
Skewness	.1413793	Kurtosis	-.1815541
Normality Test Value	0.994	Reject if > 1.117(10%)	1.179(5%)
K.S. Normality Test	0.08367	Reject if > 0.129(10%)	0.141(5%)
√b1 0.14 Skew-Z	0.39 Pr 0.6937	b2 2.69 Kurt-Z	-0.06 Pr 0.9557
D'Agostino-Pearson Omnibus K^2 Normality Test		0.2	Pr 0.9240
100-%tile (Maximum)	82	90-%tile	72
75-%tile	68	10-%tile	47
50-%tile (Median)	58	Range	45
25-%tile	52	75th-25th %tile	16
0-%tile (Minimum)	37	C.L. Median(95%)	54, 64

37----------Line Plot / Box Plot----------82
1 1 1 1 1 4 1 13 1 1 13 2 1 2 2 11 12 1 2 1 1 1 1
---------[XXXXXXXXXmXXaXXXXXXXXXXXXXX]-------

Distribution & Histogram

Variable: TYPING SPEEDS Filter: COLLEGE = 2

Bin	Lower	Upper	Count	Prcnt	Total	Prcnt	Histogram
1	37	40.75	1	2.6	1	2.6	:*
2	40.75	44.5	2	5.1	3	7.7	:**
3	44.5	48.25	1	2.6	4	10.3	:*
4	48.25	52	5	12.8	9	23.1	:*****
5	52	55.75	6	15.4	15	38.5	:******
6	55.75	59.5	7	17.9	22	56.4	:*******
7	59.5	63.25	3	7.7	25	64.1	:***
8	63.25	67	4	10.3	29	74.4	:****
9	67	70.75	4	10.3	33	84.6	:****
10	70.75	74.5	3	7.7	36	92.3	:***
11	74.5	78.25	1	2.6	37	94.9	:*
12	78.25	82	2	5.1	39	100.0	:**

FIGURE 7

Expected Mean Squares ... Balanced Case

ource	DF	Expected Mean Square (S stands for ERROR).
	2	S+bnA
	1	S+anB
B	2	S+nAB
	158	S

Analysis of Variance Report

NOVA Table for Response Variable: TYPING SPEED

ource	DF	Sum-Squares	Mean Square	F-Ratio	Prob>F	Error Term
(SEC LEV)	2	437.7343	218.8671	1.54	0.2166	ERROR
(COL DIV)	1	2.69246	2.69246	0.02	0.8905	ERROR
B	2	171.084	85.54202	0.60	0.5481	ERROR
RROR	158	22390.69	141.7132			
OTAL(Adj)	163	22970.7				

Means & Standard Errors for Y = TYPING SPEED

erm	Count	Mean	Std.Error
LL	164	62.30212	
: SEC LEV			
	19	65.13889	2.731042
2	110	58.91945	1.135034
3	35	62.84804	2.0122
: COL DIV			
UNIV	125	61.99869	1.064756
COM	39	62.60556	1.906219
B: SEC LEV,COL DIV			
1,1	18	61.27778	2.805879
1,2	1	68.99999	11.90434
2,1	90	61.18889	1.254827
2,2	20	56.65	2.66189
3,1	17	63.52941	2.887225
3,2	18	62.16667	2.805879

TABLE 1

	SECRETARIAL LEVELS			
	1	2	3	ALL
UNIVERSITY SECRETARIES				
COUNT	18	90	17	125
MEAN TYPING SPEED	61.28	61.19	63.53	62.00
STANDARD ERROR	2.81	1.25	2.89	1.06
COLLEGE OF MEDICINE				
COUNT	1	20	18	39
MEAN TYPING SPEED	69.00	56.65	62.17	62.61
STANDARD ERROR	2.81	2.66	2.81	1.91
ALL SECRETARIES				
COUNT	19	110	35	164
MEAN TYPING SPEED	61.68	60.36	62.83	62.30
STANDARD ERROR	2.80	1.18	1.72	.93