International Journal of Internet, Broadcasting and Communication Vol.11 No.3 77-86 (2019)
http://dx.doi.org/10.7236/IJIBC.2019.11.3.77

IJIBC 19-3-11

The Study on Relationship between Mobile Phone Text Usage and Hand Dexterity

Soo-Gyung Chae

Department of Occupational Therapy, Cheju-Halla University, Korea
chae5t@hanmail.net

Abstract

The purpose of this study was to reveal how the agility of fingers directly involved in the use of mobile phones, a necessity for modern people, is related to the amount of text usage. To find out, 95 people who agreed to the purpose of this research without any limitation on visual and upper-geometry were selected. The research period was from June 27, 2018 to July 31, 2018. The evaluation tool used in this study was Grooved Pegboard, a standardized evaluation tool that measures hand dexterity, and the general characteristics of examinees such as age, text message amount, and a hand that using for text messages were investigated through interviews. Since text input methods vary depending on mobile phone types, unfamiliar methods of typing mobile phone characters can affect the speed of texting. As a result, there were significant differences in hand dexterity between age and gender. The rate of texting and hand dexterity were statistically significantly faster than those in their 20s and 30s ($p<0.05$), and in gender, women showed significantly faster texting and hand dexterity than men ($p<0.05$). However, it was not statistically significant to text usage and to the dexterity of the hand.

Keywords: *Mobile phone, Dexterity of hand, Groove Pegboard, Text message*

1. INTRODUCTION

Modern society is called the information technology revolution as a society of computer brilliant development and knowledge and information, and the development of mobile phones is changing even the form of human life in modern times. Since mobile phones were launched in 1984, the number of mobile phone subscribers in South Korea has increased every year, starting with over 40 million in 2009, with more than 60 million subscribers in 2017. This is significantly higher than the United States (122.0) and China (104.6) with 124.9 subscribers per 100 people [1]. This is no exaggeration to say that all Koreans, except for infants who cannot actually use mobile phones, have more than 1.5 mobile phones and use mobile services. The increasing number of users of mobile phones that have become daily necessities has led to the so-called "Thumb Generation".

Manuscript Received: July. 3, 2019 / Revised: July. 11, 2019 / Accepted: July. 19, 2019
*Corresponding Author: chae5t@hanmail.net
Tel: +82-64-741-7696, Fax: +82-64-747-3989
Department of Occupational Therapy, Cheju-Halla University, Korea

This is for people who use mobile phones and use text messages with their thumbs. In order to write text messages such as SNS and KakaoTalk, the second to fifth fingers hold a mobile phone and support it, and the hand's ability to move the most and press the pad using the free thumb plays a particularly important role. In addition, visual concentration, memory, and eye and hand coordination are needed.

The function of the hand to manipulate a mobile phone is used to interact conclusively with the environment.

What we do when meeting with people for the first time or with people we are close to is to reach out and shake hands first. Also, there are few activities that do not use their hands, ranging from the slightest thing to big movements like sports. In all areas of life, such as meeting objects, using them, working, playing, etc., the function of hands is also the most important tool to connect with the world. The functions of the hand include a variety of functions such as dexterity, coordination, grip and endurance, but among them, the most important function in manipulating or performing things with agility is dexterity. This dexterity is strongly related to a person's ability to use their hands or control objects with their hands [2]. This is an important function of the functional performance of the upper extremities for an individual's independent life, and some researchers view it as a rapid coordination between large movements and fine movements developed through learning, training, and experience [3]. Accuracy and processing speed act as variables in hand dexterity [4, 5]. Evaluation tools that can measure dexterity of the hands include Box and Black Test, Minnesota Manual Dexterity Test, Nine Hold Peg Test of Fine Motor Coordination, O'Conner Finger Dexterity, Purdue Pegboard Test, and The Grooved Pegboard Test, etc.

The Grooved Pegboard Test used in this study was developed as a neuropsychological examination by Dr. Ronald Trites of Royal Ottawa Hospital in Ontario Ottawa, Canada, and is also used for neuropsychological evaluation, visual-motor coordination evaluation, and occupational evaluation [6, 7]. According to a report by So-Yeon Park and Eun-Young Yoo (2002), the most commonly used test tools by Korean work therapists were Purdue Pegboard Test (47.9%), Manual Function Test (45.8%), and Groove Pegboard Test (41.7%). Groove Pegboard Test was used very frequently [8], and it is an operational dexterity test tool that requires more complex visual-motor coordination skills than any other dexterity, and is used as an objective test tool to evaluate neuropsychological evaluation and visual-motor coordination capabilities [7, 8].

Looking at the prior studies on mobile phones, SNS and text messaging were more common among mobile phone functions in their 20s and 50s than voice calls, and the recognition survey of mobile phone functions showed the highest texting capabilities at all ages [9]. It also said that it would increase its immersion in interacting with others with its mobile messenger KakaoTalk, which could even predict mobile business [10], and that the results of total text messaging over the day were more likely to be receiving messages than sending them at all ages. Especially in the case of text sending, five times or more, they reported a gradual decline as the elderly grew older, while the text receiving more than five times or more represented 40% are prospective young people and less than 40% are middle-aged and older people [11]. These existing studies vary widely from cell phone addiction to research that affects depression and self-esteem [12] to examination and remote rehabilitation and functional recovery focusing on stroke patients [13, 14], although there are some studies that will be used in the future by users in the mobile industry with the efficiency of interactions and people living in modern society. However, if mobile phone users can use mobile phones, which are as large as the nation's population and have become daily necessities, for therapeutic or cognitive training purposes, it will help a little of the nation's social and medical problems that have entered an aging era. There are studies already showing that computers that are close to mobile phone development improve dexterity and are also being applied to treatment [14,15]. On the other hand, research using cell phones is very insufficient. Therefore, before studying the practical application and medical applications of mobile phones in the future, this study seeks to look at the relationship between the dexterity of the hand, which is the main physical function of cell phone use, and

the ability of the hand to communicate visual-motor coordination.

To do this, this study focuses on hand dexterity and the visual-motor coordination that required to use a mobile phone using the Grooved Pegboard Test, an objective and easy-to-use test tool. The purpose of this study is to find out how the speed of texting is related to the hand dexterity, and to see if the use of mobile phone texting will also improve the hand dexterity, and to be used as a basic data for future clinical treatment.

2. The Function of the Hand that Operates the Mobile Phone

Hand functions are generally the strength to hold the hand, and the dexterity used to move and act quickly on the fingers is one of the important functions in interacting with the outside world, which can be an indicator when assessing the function of the hand in daily life.

2.1 Importance of Hand Function

Among physical functions, the functions of the upper extremities and hands are the most important functions when operating or handling objects in daily activities. Also, the function of the hand is used when presenting creative and emotional expressions in humans, and is closely related to independence and work performance in everyday life.

The hand is a very specific organ that has the ability to acquire information or carry out activities essential to human interaction in the environment. It is also an important tool for playing activities, performing daily routines and working, and the promotion of hand functions provides opportunities for accepting various sensory information, thus improving the ability to perform play activities, daily routines and work.

Humans will not be able to make machines that are more perfectly balanced and controlled than human hands, and in some sense, the wrist is a mechanical device that contributes to the usefulness of the hand to increase the diversity of positions in which the hand is used, and it is irrelevant that all the joints in the upper extremities are the sewage of the hands. The human ability to use hands depends on the stability, movement, strength, sense, coordination and motion of anatomical structures for routine tasks.

2.2 Hand Dexterity

The main function of the hand is to stretch, grasp, and release, and the dexterity required while handling an object is an important measure [16]. This dexterity is a delicate and spontaneous movement that uses hands to manipulate small objects during certain tasks. This is the quick coordination between large movements and detailed movements that play an important role in the independent lives of individuals with the functional performance of the upper extremities and that developed through learning, training and experience [3]. It was said that accuracy and processing speed worked as variables for these hand dexterity [5].

2.3 Evaluation of Hand Dexterity

There are two important types of hand dexterity: fine manual dexterity and gross manual dexterity. Fine manual dexterity is associated with the ability to handle objects using the distal parts of the fingers and with the quick and sophisticated movements of the fingers when touching small objects. On the other hand, gross manual dexterity is a slightly larger movement than the movement between delicate fingers, which is associated with less sophisticated movements of the hands and fingers. In this study, fine manual dexterity is used.

According to Falconer and Williams, the dexterity of the hand is strongly related to the dependence of the

daily lives of older people. In other words, among many variables that do not affect dexterity (age, sex, education level, mental condition, medical problems, medicine, etc.), the dexterity of the hand is the most important determinant of independence and is associated with a person's ability to use the hand or to control objects [17]. Tools to evaluate hand dexterity include Grooved Pegboard test, Purdue Pegboard, O'conner Finger Dexterity, Minnesota Manual Dexterity Test, and Box and Black Test, etc.

3. EXPERIMENTS

First - this study was conducted on 95 people who agreed to the purpose of this research and use mobile phone text messages without any limitation on visual and upper-geometry were selected. Second- this study was conducted from June 27, 2018 to July 31, 2018 at the J University Lab in J city and 'Society Rest Area' of City Hall, which have the largest floating populations.

Third-the evaluation tool used in this study was Grooved Pegboard, a standardized evaluation tool that measures hand dexterity, and the general characteristics of examinees such as age, text message amount, and a hand that using for text messages were investigated through interviews. Since text input methods vary depending on mobile phone types, unfamiliar methods of typing mobile phone characters can affect the speed of texting. In this study, we adopted the method of using their own mobile phones to minimize these errors.

3.1 Research Procedure

After collecting information about examinees through interviews and questionnaires, tests were conducted as follows: To measure the text message speed of a mobile phone, the examinee sat comfortably in front of a desk with moderate height, using the dominant hand in writing texts from the right hand or the left hand or both. Examinees were required to see and write a particular sentence of 38 syllables as shown in Figure 1. by the tester. At this time, they have to make any text errors, and if errors occur, they were re-examined from the beginning.

Measurement of dexterity of the hand was performed in the same way as the text message writing test with the same pose. Grooved Pegboard was located on the edge of the desk and Peg Cup was suggested to be up. It was suggested that the Peg should be filled in order, from left to right when examining the right hand, and from right to left when examining the left hand, from top to bottom. The time was measured when all 25 Peg were inserted from the dominant hand at the same time that the 'start' sound was heard without practice after the tester showed the demonstration in Figure 2.

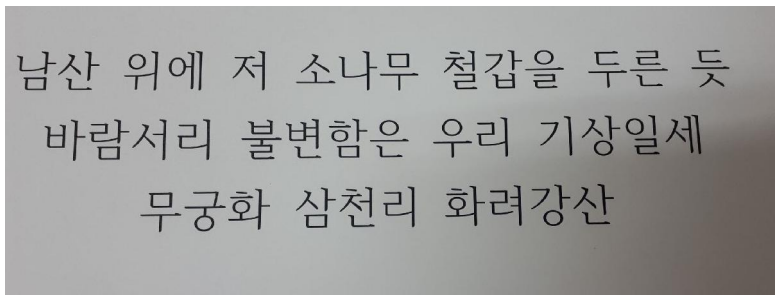

Figure 1. 38 Specific sentences of syllables.

Figure 2. Test position & Grooved Pegboard.

3.2 Data Analysis

The collected data were compiled using the SPSS (Ver 24.0) and were at a significant level $p<0.05$ for the significance test of each method of statistics. Statistical significance was verified using Pearson's correlation between mobile phone usage and hand dexterity, and differences in the amount of using test messages and dexterity of the hands were analyzed using one-way ANOVA and independent samples T-test, depending on the general characteristics of examinees, i.e., gender, age, using hand for text messages, period of use, and speed of text writing.

4. RESULT AND DISCUSSION

4.1 General Characteristics of Research Objects

Table 1. General characteristic of subjects

Characteristic	Division	Subject (N=95)	%
Gender	Male	40	42.11
	Female	55	57.89
Age	10 to 19	11	11.58
	20 to 29	69	72. 63
	More than 30	15	15.79
Using hand	Right	23	24.21
	Left	1	1.05
	Both	71	74.74
Mobile phone using period	Less than 5 months	31	32.64
	5 to 15 months	36	37.89
	More than 15 months	28	25.26

Text writing speed	Less than 40 seconds	41	43.16
	40 to 60 seconds	31	32.63
	More than 60 seconds	22	23.16
Total		95	100

The general characteristics of research objects were 40 men (42.11%) and 55 women (57.89%), as shown in Table 1. The age groups were: 11 people between 10 to 19 (11.58%), 69 people between 20 and 29 (72.63%) and 15 people over 30 (15.79%). And there were 23 right-handed people (24.21%), one left-handed person (1.05%), and 71 both-handed people (74.74%). For the mobile phone using period, 31 people used for less than 5 months (32.64%), 36 people used for 5 to 15 months (37.89%), and 24 people used for more than 15 months (25.26%). In addition, 41 people finished typing in less than 40 seconds (43.16%), 31 people were 40 to 60 seconds (32.63%), and 22 people were over 40 seconds (23.16%).

4.2 General Characteristics of Text Usage Amount for a Month

Table 2. Use text message a month according to general characteristic of subject

Characteristic / Division	Less than 300	300 to 1000	More than 1000
Male	18	12	10
Female	14	18	23
10 to 19	1	3	7
20 to 29	19	24	26
More than 30	12	3	0
Right	10	6	7
Left	1	0	0
Both	21	24	26
Less than 5 months	7	10	14
5 to 15 months	11	12	13
More than 15 months	14	8	6
Less than 40 seconds	10	10	0
40 to 60 seconds	8	13	11
More than 60 seconds	14	7	22

The characteristics of text usage amount for a month are shown in Table 2. In gender, 300 cases were reported for men and 1,000 for women, 1,000 for teenagers and 20s, 300 for 30s and older, 300 for right and left hands and more than 1,000 for both-hand. It was found that there were more than 1,000 cases of people under 5 months of use and 5 to 15 months of use, and usage more than 15 months was found to be high in less than 300 cases. Finally, for the text message typing speed, less than 40 seconds was found to be in cases with less than 300 and 300 to 1,000 cases, while 40 to 60 seconds was found to be in cases with more than 300 to 1,000 and 60 seconds in cases with more than 1,000.

4.3 Difference in Text Writing Speed

Table 3. Difference of writing speed according to general characteristic

Characteristic / Division	Subject (95)	M±SD	t(F)	P
Male	40	65.23±42.97	-2694	0,001**
Female	55	45.26±21.92		
10 to 19	11	26.38±2.78		
20 to 29	69	44.53±11.11	57.474	0.000**
More than 30	15	11.57±43.93		
Right	23	60.49±41.96		
Left	1	83.56±0.00	3.338	0.188
Both	71	51.04±30.71		
Less than 5 months	31	55.51±35.56		
5 to 15 months	36	46.12±17.68	2.290	0.318
More than 15 months	28	61.34±44.94		

* $p<0.05$ ** $p<0.001$

The mobile phone text writing speed according to general characteristics is shown in Table 3. The fastest person to complete at the speed of measured text writing was 22.36 seconds, and the latest person was 3 minutes and 26 seconds. In addition, the overall mean speed of people was 59.56±26.69 seconds. There were statistically significant differences in gender and age with general characteristics of the objects and the text writing speed ($p<0.05$). In other words, in gender, women were faster than men to type text messages, and in age, 30s were significantly slower than in teens and 20s, and the differences between all groups were statistically significant ($p<.001$). However, there was no statistically significant difference between the using hand for text messages and the using period.

4.4 Differences between Using Hands and Dexterity

Table 4. Difference of Left-hand dexterity to subject characteristic

Characteristic / Division	Subject (95)	L.t(dexterity) M±SD	t(F)	P
Male	40	71.80±29.52	-2.571	0.013*
Female	55	59.24±10.67		
10 to 19	11	59.61±9.87		
20 to 29	69	61.17±12.15	6.366	0.041*
More than 30	15	83.58±43.33		
Right	23	66.69±16.84		
Left	1	135.21±0.00	5.302	0.071
Both	71	62.84±21.46		

Less than 5 months	31	67.47±32.75		
5 to 15 months	36	63.22±10.16	1.212	0.546
More than 15 months	28	65.54±16.43		
Less than 40 seconds	41	60.42±10.43		
Less than 40 to 60 seconds	31	63.13±13.53	1.763	0.414
More than60 seconds	22	74.36±38.38		

* p<0.05

Table 5. Difference of Right-hand dexterity to subject characteristic

Characteristic / Division	Subject (95)	R.t(dexterity) M±SD	t(F)	P
Male	40	74.84±27.82	-1.278	0.204
Female	55	68.43±21.07		
10 to 19	11	65.66±12.63		
20 to 29	69	66.81±13.24	9.773	0.008*
More than 30	15	95.02±47.36		
Right	23	76.23±36.97		
Left	1	125.51±0.00	4.365	0.113
Both	71	69.47±23.39		
Less than 5 months	31	76.23±36.97		
5 to 15 months	36	69.15±11.91	0.034	0.983
More than 15 months	28	68.04±11.66		
Less than 40 seconds	41	66.12±14.36		
40 to 60 seconds	31	67.26±11.91	8.225	0.016*
More than 60 seconds	22	86.15±41.35		

* p<0.05

The difference in dexterity is as shown in Table 4. and Table 5. First, the fastest speed was 40.51 seconds in the difference with right-hand dexterity, and the slowest was 214.78 seconds. The total mean of the objects was 70.88±18.97 seconds. There were statistically significant differences in right-hand dexterity in gender and age. In gender, women were faster than men for the dexterity. In addition, there were no statistically significant differences between teens and 20s, although 30s' right-hand dexterity was statistically significantly lower than teens and 20s. The dexterity of the left-hand, as shown in Table 5, was significantly less for 30s than teens and 20s, and statistically there were significant differences between groups ($p<0.05$). It also showed a significant dexterity of hands and statistically significance between groups: people that took more than 60 seconds to write text messages have significantly less hand dexterity than people that took 40 to 60 seconds and those that took less than 40 seconds.

4.5 Correlation between the Amount of Text Messages in a Month and Hand Dexterity

Table 6. Correlation between hand dexterity and use text message one month

	Use text message	dexterity of Right-hand	dexterity of Left-hand
Use text message	1	-0.070 (0.500)	-0.079 (0.446)

There was no statistically significant difference between the text message amount in a month and hand dexterity: the correlation coefficients of right-hand and left-hand dexterities relative to the monthly amount of text messages are 0.500 and 0.446.

5. CONCLUSION

In this study, the results of this study are as follows.

First, mobile phone text messages speed was statistically significantly different for gender and age. Women were faster than men, and there were statistically significant differences between 30s and 10s with 20s ($p<0.05$), but there was no significant difference between 10s and 20s. Second, in the hand dexterity according to general characteristics, in the case of right-hand, women were faster than men, and there were statistically significant differences between 30s and 10s with 20s ($p<0.05$). Third, in left-hand dexterity, 10s were statistically significantly faster than 20s and 30s ($p<0.05$). Groups that took more than 60 seconds at texting speed were statistically significantly less with hand dexterity than those that took less than 40 seconds and 40 to 60 seconds ($p<0.05$).

The next study needs to expand the number of people studied into each age group, and it is hoped that studies will be expanded on whether there is a hand function enhancement through mobile phone use, such as hemiplegia patients who need medical services, and how they are involved in the enhancement of hand function and concentration among intellectually disabled children and adolescents.

Acknowledgement

This study was approved in 2018 by the Research Ethics Committee of Cheju-Halla University.

REFERENCES

[1] Korean Statistical Information Service,2017.
http;//Kosis.kr

[2] CA. Trombly, *Occupational therapy for physical dysfunction*, 3rd, Baltimore: Wiliams & Wilkins. 512-530,1989.

[3] F. Poirier, *Dexterity As a valid measure of hand function*: A pilot study occupation therapy Health care, 4, 69-83, 1989.

[4] C.S. Jane and C.O.Jan, *Occupational therapy for Children and Adolescents.* 7th ed, Seoul: ELSEVIER. 249-287, 2018.

[5] A. Catherin, Hand Impairment In C.A Trombly and M.V Radomsi(Eds), *Occupational Therapy for physical dysfunction*. philadelphia : Lippincott, williams & wilkns, 5th ed, 927-964, 2002.

[6] T.Y. Lee, "Normative values for Grooved pegboard test in Adult", *Korean Research Society of Physical Therapy,*

Vol.8 No.2, 87-95.2001
[7] H.S. Lee, *Clinical Occupational Therapy Assessment.* Seoul: Gyechuk, pp.257-269, 2017.
[8] S.Y. Park and E.Y. Yoo, "The Use of Occupational Therapy Assessment Tool by Korea Occupational Therapist", *Journal of Occupational Therapy,* Vol.10, No 2, pp. 99-108. 2002.
[9] M.H. Park, Y.J. Kim, S.T. Lee, and M.Y. Choi, "A Study on the User Needs by Age Group in Mobile Phone"- "focused on the Difference of Use Frequency and Necessity for Function of Mobile Phone between 20s and 50s." *Journal of Digital Design,* Vol.7, No.4, pp.269-276, 2008
[10] S.H. Lee, S.I Kim, and H.Y. Kim, (2013). "An Investigation on the Motivation and the Reciprocity of the Usage of Mobile Messengers and Its User Immersion- Focusing on Kakaotalk" *Journal of Digital Design* Vol. 13, No.1,pp.479-488, 2013.
DOI: http:dx,doi.org 10.17280/jdd.2013.13.1.046
[11] J.L. Kim, S.H. Kim, Y.J. Joe, and E.J. Joe, “Analysis of Usage Pattern of Mobile Phone Interface by Age Group including the Elderly”, *Ergonomics Society of Korea*, 122-127,2008.
[12] H. Lee and S.M. Yang “Differential effects of parenting styles, psychological traits, and purpose of smartphone use upon Korean adolescent’s smartphone dependence”, *Korean Journal of Journalism & Communication Studies* Vol.62 No.5, pp.175-214, 2018.
DOI: http:dx,doi.org /10.20879/kjjcs.2018.62.5.006
[13] C.I. Kim, H.J. Jeon, S.Y. Lee, and J.H. Kim, “The Effect of Dual Task Using Mobile Phone and Foot Position on center of pressure for patients with Chronic Stroke, *Journal of Korea Society for Neurotherapy,* Vol.19 No3, pp.11-15, 2015
DOI: http:dx,doi.org/10.17867/2015.09.06.253
[14] S.H. Han, D.I. Kim, J.H. Kim, A.R. Park, J.A. Lee, and K.Y. Kam, “Effect of Tele rehabilitation Using Mobile Phone on Motor Function Recovery in Chronic Stroke Patients”, *The Journal of Korean Society of Occupational Therapy,* Vol.20 No.3, pp.67-79, 2012.
[15] Y.J. Chung, *Treatment efficacy: The computer as a treatment supplement for improving word comprehension and production in aphasic adults*, The Graduate School, Ewha Women University, 2002.
[16] D. A. Neumann, *kinesiology musculoskeletal system*. Seoul: jdmpub. 256-259, 2004.
[17] E.J. Park, J.M. Park, E.J. Bae, M.H. Yong, and K.M. Kim, “The Relationship Between Hand Dexterity and Writing Message Seed with Mobile-Phone in University Students”, *The Journal of Korean Society of Occupational Therapy,* Vol.13 No3, pp.59-66, 2005.