Vol. 7, No. 1, pp. 35-38, June 2008

INTERNATIONAL JOURNAL OF SAFETY
www.kosos.or.kr

A Study on 3-D Standard Posture of Korean Adults for VDT Task

Yong Hyuk Choi, Jong Sik Park[1], Tae Gu Kim* and Seong Beom Lee[1]

Department of Occupational Health & Safety Engineering, Inje University, Gimhae, Gyeongnam 621-749, Korea
[1]Department of Mechanical Engineering, Inje University, Gimhae, Gyeongnam 621-749, Korea

(Received February 15, 2008; Accepted May 12 , 2008)

Abstract : The purpose of this study is to extract typical body shape of Korean VDT workers based on the three-dimensional Korean shape data and recommendation supported by Korea Occupational Safety & Health Agency during VDT task. Desirable desk heights and chair heights for the selection of the VDT working posture is proposed by analyzing moment, compression and joint shear for lumbar and spine of Korean adult(male and female). The desirable heights for desk and chair can be selected by the least load method during VDT tasks. In the current work the figures of Korean 50th percentile offered by CATIA-HUMAN are used as the average body type of the grown-ups and this research is accomplished with the recommended size of all working attitude such as the height of a monitor except for the height of desk and chair and the degree of watching the monitor..

Key words: VDT, korean adult average shape, desk and chair, L4-L5 moment, compression

1. Introduction

Industrial structure is gradually advanced from the primary and secondary industries based on manufacturing to tertiary industries by developing industry of South Korea. So the number of office workers and the working time with desk and chairs is increasing. Office workers expose occupational disease in accordance with increase of the number of worker and working time. Since recommendation of VDT work supported by Korea Occupational Safety & Health Agency just describes simple numerical value which means proper standard of a chair and desk, a distance of monitor and monitoring angle, workstation have a difficulty to try enhancements of working environments.

Therefore, the goal of this study is to propose specific height of chairs and desks for load of lumbar and spine by applying to different height of chairs and desks. Factor of measurements have Moment, Compression, Joint Shear in accordance with differential height of chairs and desks Since this study show that it models height of chairs and desks which proposed this study and Korean standard male and female shapes during VDT tasks by using CATIA-HUMAN, whoever tries to enhancements of workstation easily learns safety posture during VDT tasks.

*Corresponding author: tgkim@inje.ac.kr

2. Selection Of Korean Male And Female Standard Posture

In order to model Korean male and female standard posture during VDT tasks, a comparison of body size shows that real body size of Korean average male and female nearly match body size supported by CATIA-HUMAN during modeling from project of SIZE Korea. Because of the fact that body size of Korean average male and female supported by CATIA-HUMAN is valid, modeling the real task posture of male and female is available during without

Table 1. Data of figure of Korean adults generated from CATIA

Body Index (mm)		SEX	
		Male	Female
Height	Height	1702	1580
	Height of Hip	781	714
	Sitting Height	921	866
	Height of sitting view	809	760
Sitting Height	Height of Sitting Hip	349	339
Length	Length of upper Arms	333	307
	Length of Legs	961.28	910

using other variables. Modeling data of Korean male and female from CATIA-HUMAN are shown in Table 1. Based on body size of Table 1, modeling of male and female visualizes results by using CATIA-HUMAN in Fig. 1 and Fig. 2 espectively. By such a method, characteristics of human body are determined about Korean adult standard VDT workers. As it is complex to model each Percentile and analyze load for human body, the value of Percentile set 50 Percentile which is average body shape. If human body variables are applying to all body shape, maximum and minimum by inserting human body variables of standard body shape, it can be available that load can be measured during every body shape's modeling of worker and tasks.

3. Modeling of Vdt Working Posture and Measurement of Body Load

This data describe that shape of workers during real VDT tasks performs modeling by choosing body size of Korean average male and female. In accordance with recommendation of VDT work supported by Korea Occupational Safety & Health Agency, variables such as condition of device, posture of working, and working environments are unified during modeling and it is focused on measurements about which height of chair and desk is adapted on the worker during VDT tasks.

In accordance with recommendation of VDT work supported by Korea Occupational Safety & Health Agency, proper height of desk is 60~70cm and height of chair is 35~45cm during tasks. It isn't specific considering difference of between male and female as well as shape of workers. According to desk and chair's height, degree of body shape's load and values of moment and compression describe big difference in table 2, so this study is essentially needed. Although degree of load is not different from numeric values, load of human body about modeling of working posture has limits which don't apply to time domain. So little difference of load can make worker tired when prolonged work. Therefore, analysis of Moment, compression, Joint Shear (which are) loaded to lumbar are performed. According to table2, the result of analysis about amount of loads which influences height of chair and desk shows that the value of moment(NxM), Compression(N), Joint Shear(N) is largely different even in the 2cm difference. As this value shows that overtime workers would be exposed to significant load during VDT tasks, analysis about

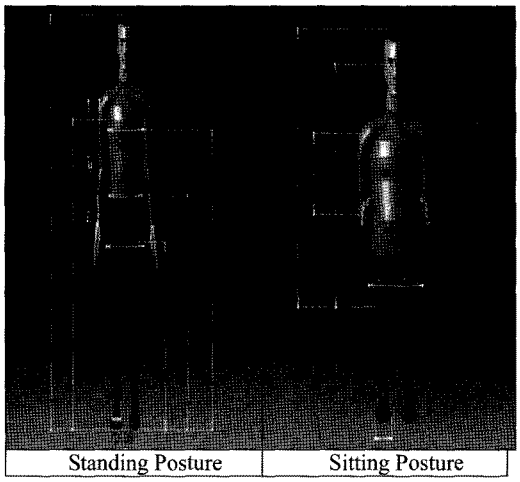

Fig. 1. Modeling of Korean standard male's figure.

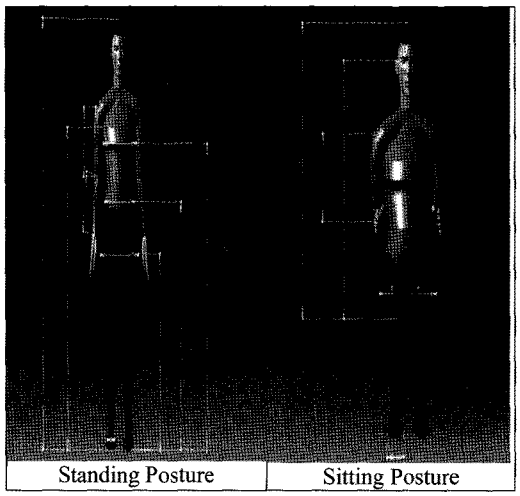

Fig. 2. Modeling of Korean standard female's figure.

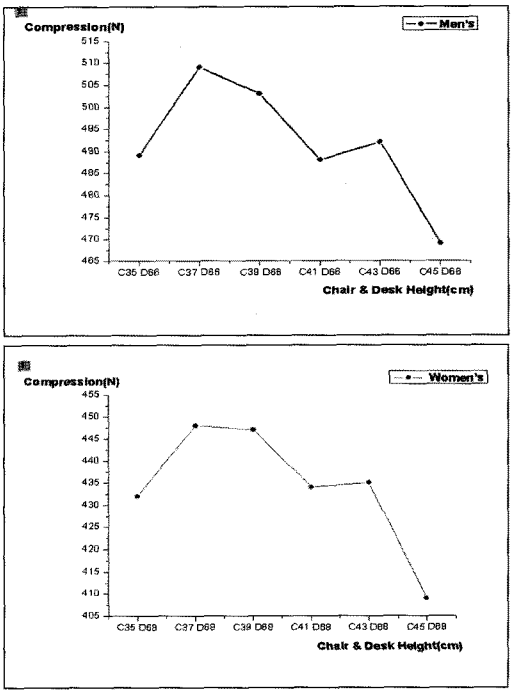

Fig. 3. Minimum Compression Value

Table 2. Load of lumbar of Korean adults When VDT tasks

50 Percentile	Male			Female		
Body Load / Chair & Deskheight	L4-L5 Moment (Nxm)	L4-L5 Compre -ssion(N)	L4-L5 Joint Shear(N)	L4-L5 Moment (Nxm)	L4-L5 Compre -ssion(N)	L4-L5 Joint Shear(N)
C 35 D 60	9	513	32	10	449	30
C 35 D 62	9	526	32	10	438	29
C 35 D 64	8	494	30	10	437	29
C 35 D 66	8	489	30	9	431	28
C 35 D 68	9	501	31	9	432	28
C 35 D 70	10	522	33	9	429	28
C 37 D 60	11	545	29	11	464	26
C 37 D 62	11	553	28	11	458	26
C 37 D 64	10	521	27	11	453	25
C 37 D 66	9	509	25	11	454	26
C 37 D 68	10	524	27	10	448	25
C 37 D 70	11	536	28	11	449	25
C 39 D 60	11	546	29	11	458	26
C 39 D 62	13	578	31	11	463	27
C 39 D 64	9	515	26	10	448	25
C 39 D 66	9	503	25	10	447	25
C 39 D 68	10	521	27	10	444	25
C 39 D 70	9	512	26	10	434	24
C 41 D 60	11	548	30	10	446	25
C 41 D 62	13	586	32	11	458	26
C 41 D 64	9	512	26	10	446	25
C 41 D 66	8	488	24	10	446	25
C 41 D 68	9	512	26	10	434	24
C 41 D 70	9	509	26	10	435	24
C 43 D 60	13	584	32	10	443	25
C 43 D 62	13	589	33	10	450	26
C 43 D 64	9	514	27	10	440	25
C 43 D 66	8	492	25	10	439	25
C 43 D 68	8	503	26	10	435	25
C 43 D 70	9	515	27	10	434	24
C 45 D 60	12	566	37	8	413	28
C 45 D 62	11	554	43	9	421	28
C 45 D 64	7	480	30	9	419	28
C 45 D 66	**6**	**469**	**29**	9	418	28
C 45 D 68	8	489	31	**8**	**409**	**27**
C 45 D 70	8	489	31	8	413	28

height is largely reasonable. Analysis of load about height of chair and desk show that the least amount of loads measures 6 moment (NxM),469 Compression(N), 29 Joint Shear(N) at 66 cm desk, 45cm chair in case of man and 8 moment(NxM), 409 Compression(N), 27 Joint Shear (N) at 68 cm desk, 45cm chair in case of women respectively. Also, degree of Compression about height of worktable analyze that worktable height for male and female have less degree of Compression than other height in case of 66cm and 68cm respectively. This value is most reasonable height for workers who do VDT tasks according to a range of 10cm (60~70cm) recommended by Korea Occupational Safety & Health Agency. Since the analyzed height of chair and desk more specific value considering real body shape than a range of 10cm (60~70cm) recommended by Korea Occupational Safety & Health Agency, if proper height for specific body shape of male and female respectively are used during VDT tasks, it can be beneficial against occupational disease such as CTDs.

4. Recommended Model of Korean Standard Posture of Vdt Tasks

There is no great difference between visualized work posture and usual VDT work posture, but work posture shown Fig.4,5 satisfies (like Table 3) all item recommended by Korea Occupational Safety & Health Agency as well as simplifies necessary matters when improving prevention of occupational disease for workers by visualizing work posture. The Fig. 4,5 shows items of "the VDT tasks guide" recommended by Korea Occupational Safety & Health Agency including height and condition of desk, height, depth and width of chair, angle and shape of the back of the chair, height and distance of screen and posture of waist, wrist. Those items are 13 expecting working environments of light and reflected light which have no relation.

5. Conclusion

This study studies the proper heights of the desk and chair during VDT task in order to model Korean standard posture. So, modeling of working posture that satisfies the working standard posture or environments and conditions of device is performed under height of desk and chair with the least load. Therefore, modeling of male and female can be visualized by 3-D modeling which is more specific than recommendation supported by Korea Occupational Safety & Health Agency so that the workplace can improve working posture to prevent occupational disease such a CTDs. We need to analyze degree of loads followed by increase of the long time and analyze comprehensive body

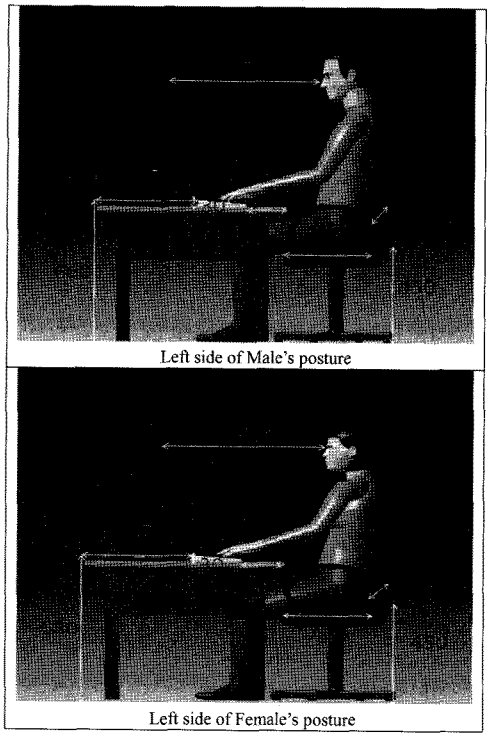

Fig. 4. Left side of recommended model of Korean standard posture for VDT tasks

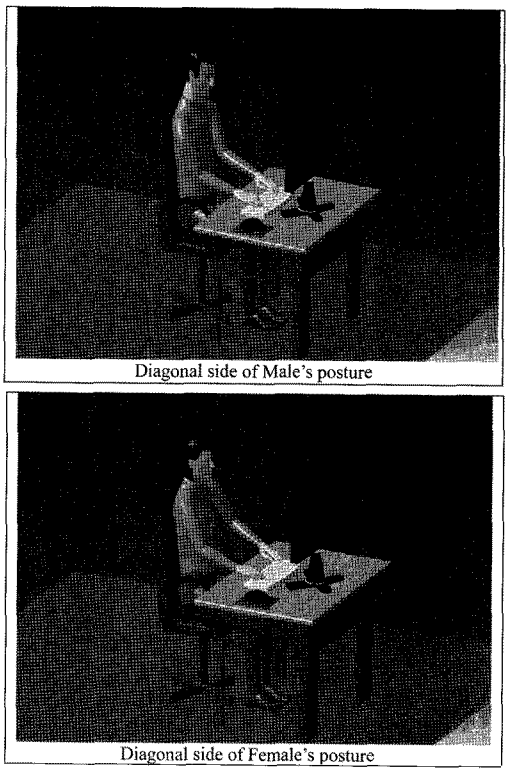

Fig. 5. Diagonal side of recommended model of Korean standard posture for VDT tasks

Table 3. Agency recommended condition and Actual Modeling Condition of VDT work

Working Condition	Recommended Condition	Actual Modeling Condition
Height of Desk (cm)	60~70	-
Height of Chair (cm)	35~45	-
Height of Keyboard (cm)	30	30
Depth of Desk (cm)	38~42	40
Width of Desk (cm)	40~45	42
Angle of the back of a chair(°)	90~120	96.67
Space of lifting Wrist (cm)	About 15	15
Distance of Monitor (cm)	55~65	65

region such a shoulder, neck, wrist and etc without mentioning lumbar and spine.

References

[1] Seungwoo Hong, Sungjoon Park and Eui S. Jung, "3-D Body Typing of Korean Adults and its Application to Vehicle Design", Journal of the Ergonomics Society of Korea., Vol. 25, pp. 85-93, 2006.

[2] Jonghyun Shin, Minyong Park and Jungyong Kim, "Design of a New-Concept VDT Workstation Chair for Improving Work Safety", Journal of the Korean Institute of Industrial Engineers., Vol. 25, pp. 459-465, 1999.

[3] Mitsuyuki Kawakami, Shinichi Aoki and Takao Ohkubo, A study of "fragrance" on working environment characteristics in VDT work activities", Int.J.Productio Ergonomics, 1999.