A Survey of Inconveniences and Injuries Experienced by the Left-handed People from Using Right-handed Products

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오른손잡이 전용제품 사용에 있어서 왼손잡이의 불편도와 상해경험에 관한 연구

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Abstract

대부분의 사람들은 의식하지 못하지만 세상은 오른손잡이 중심으로 이뤄져 있기 때문에 왼손잡이가 일상적으로 겪는 불편은 상상외로 많다. 우리가 일상에서 많이 사용하는 연장, 주방기구, 사무용품, 가전제품, 가구, 의류, 악기, 의료기기, 스포츠용품, 공공시설 등 이들 대부분이 오른손잡이에게 맞춰져 있어 왼손잡이들은 자신들의 왼팔을 비틀어서 사용하거나 주손이 아닌 오른손으로 부자연스런 자세로 사용할 수밖에 없다. 이에 따라 왼손잡이는 일상생활에 있어서의 상당한 불편을 느낄 뿐만 아니라 작업 능률의 저하, 재해나 상해를 입을 가능성이 높아질 수 있다.

본 연구는 무작위로 선정된 피설문자에 대한 설문 조사를 통하여 손잡이(handedness)와 관련된 통계수치를 제공하고 왼손잡이인 경우 왼손잡이로서 일상생활에서의 불편함, 작업능률의 저하여부, 오른손잡이 전용제품을 사용하여 상해를 입은 경험 등에 대해 조사하였다. 또한 왼손잡이도 편리하게 사용할 수 있으면 하는 제품이나 공공시설 등에 대한 이들의 주관적인 견해에 대해서도 조사하였다. 이를 토대로 왼손잡이를 위한 공구, 주방용품, 문구용품, 스포츠용품, 사무용품 등에 대하여 현재 적용되어 있는 상품에 대한 고찰과 향후 적용 가능 상품 및 공공시설에 대해 제안하였다.

Keywords : Left-handed, Right-handed, Handedness, Hand dominance, Inconvenience, Injury

1. Introduction

A majority of the people may not realize it, but we live in a right-handed world. According to the "right-sided world hypothesis (Porac and Coren, 1981)," our physical environment favors the right-handed majority. Up to 98% of equipment in technologically advanced societies is designed for right-handed people including simple tools which are widely used in the home environment such as scissors, can openers, and kitchen utensils (Hardyck and Petrinovich, 1977).

Moreover, the left-handed cannot but be inconvenienced with all the everyday facilities geared for the right-handed: handle position and opening/shutting direction of doors, key holes, position of elevator and cash machine buttons, insert slots of subway pass machines, automobile engine keyholes and gearshift sticks, etc. Most of these are made for the right-handed people so a left-handed person has to twist his or her left arm or is forced to use his or her right hand, the non-dominant hand, in an unnatural way.

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The problems affecting the left-handed not only inconvenience those individuals, but pose a threat to the health and safety of the general public. For example, what if a left-handed surgeon or dentist were to treat patients with right-handed medical tools? Similarly, a left-handed soldier or police-officer handling right-handed weapons could equally threaten public safety. A left-handed industrial worker using right-handed machinery or tools poses the same threat within the workplace.

The left-handed people in question would experience inconveniences and at the same time become a potential risk factor to the public's health and security. Moreover, assuming that work flow or distribution of work space is passively designed to fit the right-handed worker, an unaccustomed left-handed worker would bring down work efficiency and run a higher risk of accidents and injuries (Coren, 1989; Winder et al., 2002). Therefore, Garonzik (1989) mentioned that the designer should be aware of the potential decrement in performance which may be associated with operation by the non-dominant hand, especially in critical control situations.

Salvendy (1975), Porac et al. (1990), Hoffmann (1997) and Hoffmann and Halliday (1997) demonstrated somewhat contradictory studies that left-handed individuals are not particularly hampered in performance or learning ability by using implements and tools designed for right-handed.

However, in practice, left-handed individuals have to learn how to hold the tool and manipulate it with the left hand to use right-hand oriented equipment and tools or alternatively, left-handed have to switch the hand and in many cases they are forced to do so. By doing so, the chances of making mistakes or performing inadequately must be higher than right-handed people. The simple reality is that the left-handed are highly inconvenienced in carrying out their daily tasks and routines. The "right-minded" world has, therefore, imposed handicaps on left-handed individuals (Harris, 1990).

In this study, 2,437 male and female participants were randomly selected to determine the statistical data concerning hand dominance and daily inconveniences and incidents of injury they had experienced from using right-handed products or systems. To illicit their subjective opinions questions were asked about the kind of products or public facilities they wish to use with greater convenience.

2. Survey method and procedure

This study was conducted on a total of 2,437 ranging in age from 10 to 87 with male and female compositions being 1,316 (54.0%) and 1,121 (46.0%), respectively. All participants were asked to write their gender and age as well as their hand dominance on the checklist. Table 1 shows distribution of participants and relative percentages of hand dominance by gender and six age groups. For the right-handed participants, male and female percentages were 86.5% and 86.0%, respectively; for the left-handed, 5.9% and 5.6%; and for the ambidextrous, 7.6% and 8.3%, respectively.

Among these participants, the left-handed participants were further asked to fill out answers to 6 questions concerning daily inconveniences and incidents of injury they had experienced from using right-handed products.

More specifically, to elicit their subjective opinions, questions were asked "What is your perceptional degree of daily inconvenience when you are using the hand operated devices or systems made only for right-handed people?"; "Which of the following product or facility is the most inconvenient, tools, kitchen equipment, stationary supplies, furniture and home appliances, clothing, musical instruments, sports equipment, computer and information and telecommunication related products, housing and public facilities?" Next questions were continued as "What is your perceptional degree of work efficiency when you are using the hand operated devices or systems made only for right-handed people?"; "What is your degree of injury experienced from the hand operated devices or systems made only for right-handed people?"; and "Which of the following body parts is the most injured part, neck, shoulder, back, elbow, hand/wrist, buttock/thigh, knee, and ankle/feet?" The participants were told that the responses must be related or limited to the contexts which using the right hand as a non-dominant hand. In addition, to illicit their subjective opinions questions were asked about the kind of products or public facilities they wish to use with greater convenience.

Table 1. Hand dominance by gender and age by participants' constituent (% in parenthesis)

Age group	Male				Female			
	Constituent	Left-handed	Ambidex.	Right-handed	Constituent	Left-handed	Ambidex.	Right-handed
10s	306	19(6.2)	28(9.2)	259(84.6)	246	15(6.1)	33(13.4)	198(80.5)
20s	425	29(6.8)	32(7.5)	364(85.6)	303	18(5.9)	29(9.6)	256(84.5)
30s	172	13(7.6)	10(5.8)	149(86.6)	151	11(7.3)	11(7.3)	129(85.4)
40s	163	9(5.5)	13(8.0)	141(86.5)	199	9(4.5)	11(5.5)	179(89.9)
50s	156	7(4.5)	10(6.4)	139(89.1)	107	5(4.7)	3(2.8)	99(92.5)
Over 60	94	1(1.1)	7(7.4)	86(91.5)	115	5(4.3)	6(5.2)	104(90.4)
Total	1,316	78(5.9)	100(7.6)	1,138(86.5)	1,121	63(5.6)	93(8.3)	965(86.0)

3. Results and discussions

According to the dominant hand, descriptive statistics on overall data, gender and age were analyzed. Chi-squared verification was conducted to ascertain differences in characteristics according to the dominant hand, descriptive measurements, including gender, age and the level of inconvenience were recorded and analyzed.

The main objective of this study was to provide various statistics on hand dominance and to surveying subjective opinions on daily inconveniences and injury incidents that left-handed participants experienced from using right-handed products. The followings are major findings of this study and their implications.

3.1. Hand dominance by gender and age

Percentages for dominant hand revealed that out of 2,437 participants, 2,103 (86.3%) were right-handed, 141 (5.8%) left-handed and 193 (7.9%) ambidextrous (Table 1). The results of Pearson Chi-squared verification showed that the distribution by age ($p=.022$) fell within the significant level of $p<.05$ whereas that by gender ($p=.768$) did not.

The relative percentages of hand dominance by gender and age show slightly more male than female participants to be left- and right-handed. However, there were more female found out to be ambidextrous than male participants.

The percentage of right-handedness gradually increases as age goes up for both male and female participants except 50s of female being the highest (92.5%). The left-handedness was highest on 30s for both male and female participants and the percentage proves to be higher below 30s (10~20s) than above 30s (40~over 60s). As for the ambidextrous, they were particularly prominent in the age of 10s for both gender, and their percentage decreased with age for female but fluctuated in male. Interestingly, however, their number goes up again in over 60's.

The left-handed figure in this study turned out to be lower to the survey made by Jung and Jung (2005), that is, 8.2% of Koreans were left-handed. Even though there are no big differences between the male (5.9%) and female (5.6%) participants, this result is similar to the finding in the study of Annett (1985), who noted that males had a higher rate of becoming left-handed than that of females, and the result in the study of Gilbert and Wysocki (1992), who found that more males (12.6%) were left-handed than females (9.9%) of 1,177,507 participants.

Statistics have been shown that older people were less likely to be left-handed than their younger counterparts so that the percentages of left-handed people sharply drops with age (Beukelaar and Kroonenberg, 1986; Dellatolas et al., 1991; Gilbert and Wysocki, 1992). The results of this study support these trends.

3.2. Degree of daily inconveniences and injuries of the left-handed

A considerable number of the left-handed participants felt that they experienced inconvenience in everyday activities and they had a higher probability of being in accidents and getting injured from using systems and equipment designed for the right-handed.

In regards to the level of inconvenience experienced in everyday activities as a left-handed person, Figure 1 shows that 65.0% were troubled to some degree from 'very inconvenient (15)' to 'a little inconvenient (77)' and 35.0% answered positively as 'do not feel inconvenient (38)' or 'not inconvenient at all (11)' out of 141 left-handed participants.

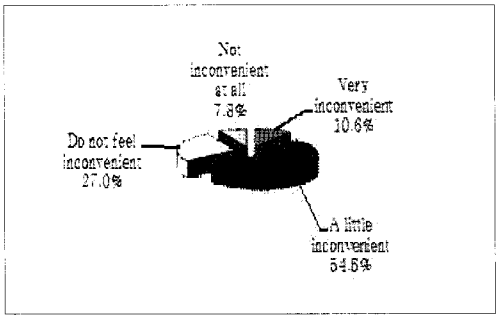

Figure 1. Degree of inconvenience living as a left-handed person

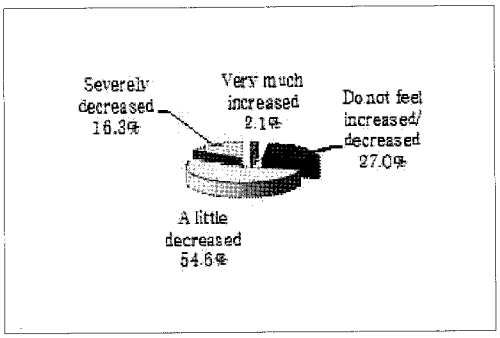

Figure 2. Degree of work efficiency perceived by the left-handed

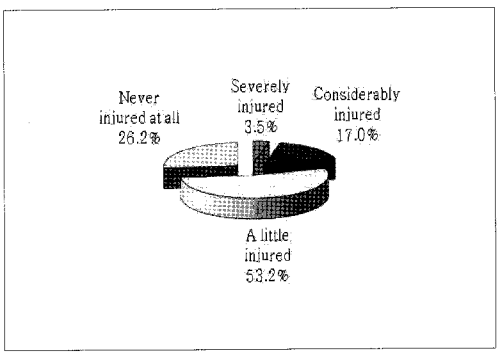

Figure 3. Degree of injury experienced as a left-handed person

The level of inconvenience experienced in everyday activities as a left-handed person showed that two third of participants were troubled to some degree from very inconvenient to a little inconvenient. In particular, 37.1% of the left-handed younger participants (10s~30s) and 27.8% of the left-handed elder participants (40s~over 60s) answered positively, that is as 'do not feel inconvenient' or 'not inconvenient at all.'

The verification of the Chi-squared test resulted as P=.974 between the age group and the level of inconvenience. Therefore it could not be said that as a left-handed person gets older, he or she becomes more accustomed and feels less inconvenienced by daily activities in a right-handed world. In addition, results of the most inconvenient products or systems revealed that 'tools' ranked the highest and others ranked in order of kitchen equipment, stationary supplies, furniture and home appliances, housing and public facilities, and miscellaneous.

Figure 2 shows the degree of work efficiency perceived by the left-handed participants from using products or facilities designed for the right-handed, a considerable portion (70.9%) of left-handed participants felt that their performance were decreased by using right-handed devices. Among 141 left-handed participants, 23 participants were 'severely decreased,' 77 'a little decreased' and interestingly, 3 felt 'very much increased.'

Figure 3 shows the injuries experienced by the left-handed participants from using products or facilities designed for the right-handed, a considerable portion of left-handed participants answered positively. In detail, 5 participants were 'severely injured,' 24 'considerably injured' and 75 felt only 'a little injured,' and in total, accounted for 73.8% of all left-handed constituents. The remaining 37 (26.2%) were 'never injured at all.'

Hicks et al. (1993), Graham and Cleveland (1995), Taras et al. (1995) and Winder et al. (2002) reported that the left-handed have a higher probability of being in accidents and getting injured from using systems and equipment designed for the right-handed. With slight differences in actual figures, on average, the probability of automobile accidents was 55%, tool related accidents 54% and household accidents 49% higher than that of a right-handed person. Halperin and Coren (1990) also reported that the left-handed have a higher death rate due to accidents.

The injuries experienced by the participants from using products or facilities designed for the right-handed, 73.8% of all left-handed constituents responded positively. This means that over two thirds of the left-handed had been injured from using various items designed for the right-handed. Although these figures are not directly comparable to the above studies, more left-handed people are exposed to possibilities of getting injured than right-handed. As expected, the body parts which is the most injured part answered was in order of hand/wrist, elbow, knee, and ankle/feet, neck, shoulder, back, and buttock/thigh?"

3.3. Suggesting future application of products and facilities for the left-handed

With the exception of few investigations, left-handed individuals have not been considered in the ergonomic design of products and places of work. The population of left-handed is expected to be increased. There is, therefore, a big need for ergonomic data for left-handed(Schmauder et al., 1993).

Subjective questions for left-handed participants were asked about inconveniences in daily routines and workplaces that they experienced as a left-handed person and about products and facilities they wish to use more easily. The overall participants answered in the positive as there were not many specially designed products available for the left-handed. Based on the survey results and reference materials, existing products and facilities designed in consideration of the left-handed and suggestions for future applications are as follows.

A. Tools

As an example of agricultural tools, a left-handed sickle has been made so that the blade can be seen when held by the left hand. Other applications include saws, hammers, screwdrivers, measuring tapes, battery-operated scissors, electric drills, locks, mowers, various medical tools and surgical equipment and also position and arrangement of dual sided unit chairs used at the dentist, optometrist and otorhinolaryngologist. In addition, weapons need to be manufactured in a way that has safety measures and shell release structures installed for the left-handed. Lastly, gas masks for the left-handed are needed.

B. Kitchen equipment

Various kinds of kitchen equipment have been designed for the left-handed, to enhance their convenience. For example, blades of kitchen scissors and knives face the left side when held by the left hand and ladles, spatulas and ice cream scoopers have also been modified. Future applications can be made to vegetable peelers, tea cups, the position for rice and soup on cafeteria trays, refrigerator door and microwave door handles and the turning direction of gas burner handles.

C. Stationary supplies

Stationary and office supplies for the left-handed user are relatively more prevalent than other products. Left-handed cutter and scissors are designed in reverse structure of those for the right-handed. Scales of rulers and measuring tapes start from left to right and pencil sharpeners have handle that have to be turned counter clockwise with the left hand. Books, notebooks, pocketbooks and ring binders can all be designed to have pages turning from left to right. Arrangement of buttons on electronic calculators or copy machines can also be lined up in the same manner.

D. Furniture and home appliances

All classroom desks in colleges and universities in Korea have arm rests on the right side. As such, left-handed students would have to turn their bodies or lift their elbows in the air and write in uncomfortable positions.

These institutions need to provide a certain percentage of specialized desks for the left-handed. Moreover, similar applications can be made for closet handles, the opening direction of lockers, adjusting position of chair heights and position of desk drawers.

E. Clothing and accessories

Buttons and zippers on pants are sewn on the right side and are thus difficult to do and undo with the left hand. Shirt pockets are hard to reach as they are usually on the left side. Watches with control screws on the left side make them hard for a left-handed user to set the time. Future applications are possible for sewing machines, waist belts and ladies hair berets.

F. Musical instruments

By reversing the design structure of piano keyboards and pedals, the existing piano and musical scores can be for the left-handed. Similar applications can be made to other string instruments such as the guitar, violin and cello and respective scores along with the hand that plays the xylophone.

G. Sports equipment

The boomerang is already designed to fly back counter clockwise. Other applications include hiking

equipment, fishing reels, golf clubs, baseball gloves and helmets, bowling arm braces, pocket knives and hockey sticks. For the game of polo, it is definitely impossible for left-handed to play and at present left-handed players are not allowed to play.

H. Computer and telecommunication products

Button positions on cellular and home phones could be changed to befit users that hold them with their left hands. Other candidates for future modification include keyboards, mouse, joy sticks, camera shutter positions, coin slots of video game machines and credit card scanners. For software, possible applications would be to software menus and scroll bar positions.

I. Housing and public facilities

The left-handed cannot but be inconvenienced by all the everyday facilities geared for the right-handed: handle positions and opening/shutting directions of doors, key holes, positions of elevator and cash machine buttons, insert slots of subway pass machines, automobile engine keyholes and gearshift sticks, etc.

Future applications can be made to door opening directions and receiver positions in public phone booths, pens on chains in banks, flush levers and toilet paper positions in washrooms, and lastly, regarding vending machines, coin slots and selection button positions and the turning direction of coin return levers.

4. Conclusion

Annett (1985) noted that left-handedness is hereditary and decided by the brain, so one should not try to become right-handed deliberately. "If the left sided brain is dominant, you are right-handed and if the right sided brain is dominant, you are left-handed."

Therefore, "one cannot change, as if an unwanted habit, the nervous system that has each side of the brain controlling the opposite side of the body." Instead of trying to make the left-handed adjust by becoming right-handed, social and technical consideration should be taken so that left-handed individuals can use their left hand freely and without hesitation.

At present, such efforts are adequately being made in western countries such as the US, Canada and England. In the beginning of the school year, students are tested to determine who are left-handed in order to provide desks and facilities befitting their needs. Teachers give special counsel to left-handed students so that they may comfortably use their left hand in daily routines. Many school and daily supplies are now produced for the left-handed and are easily purchased in general as well as specialty stores. The local environment is comparatively poor, but specialty stores for the left-handed are newly opening and associations are acting. Not only do they work to protect and enhance the rights and interests of the left-handed, but also move society on a national level to correctly understand and recognize the left-handed in a positive manner.

The first and more urgent measure to be taken is to institutionalize a law that enforces a certain percentage of all manufactured products to be additionally made for the left-handed. The businesses that produce left-handed products should then receive tax benefits or exemptions or production or development funds. And if possible, designs should be geared toward both right-handed and left-handed users (for example, modifying the handle direction of fishing reels or electric drills).

Furthermore, public and private sectors together have to set up a system to produce and distribute left-handed products and consider designing public locations and facilities in a way that left-handed and right-handed people can commonly use them.

Related future studies should be made to investigate cases in which a left-handed person naturally became ambidextrous or right-handed because it was easier to conform to the demands of society, parents or colleagues or simply a matter of having to adjust after an accident or injury. An epidemiological study should also be conducted instead of using questionnaire study for investigating injuries of the left-handed people.

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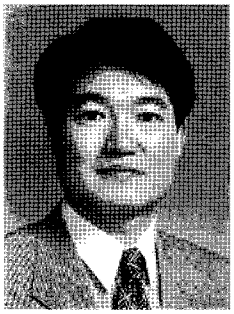
저 자 소 개

정 화 식



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