

The Relationship between Dominant Hand and Non-dominant Hand on Grip Strength in Middle Age and Elder Female

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Abstract. Hands play the most important role in human's daily works. Severely repetitious actions lead to damage of hands easily due to muscle fatigue. However, using muscle less because of damage and muscle mass decreasing because of aging probably affect their grip strength, the purpose of this study was to assess the grip strength between dominant & non-dominant hand in different age groups 65 right handed subjects over 55 years old in Chiayi were chosen randomly. 65 subjects were decided into four groups by age. The first group was ranged age 55-60 (N=22), second group was age 61-65 (N=16), the third group was age 66-70 (N=14), and the final group was over 71 years old (N=13). All subjects did the grip test separately by testing dominant and non-dominant hands three times with 1 minute break during each test. Subjects stood with hands placing on the side of body and held the dynamometer. Hold the handle at full stretch with straight elbows and choose the best consequence. SPSS 12.0 was used in the study to analyze the data with descriptive statistics and one way ANOVA. The significant level (α) is $<.05$. If the significantly difference occurs, Schffe method will be operated to do the post hoc comparison. The result showed that the dominant-hand grip of female in 55-60 and 66-70 years old have already reached the significantly difference, while the non-dominant hand grip of female in 66-70 years old reached the significantly difference. Muscle mass decreases fast under the condition of aging, however, decreasing the activity of muscle due to damage when the subjects repetition on used their dominant-hand.

Keywords: Dominant-hand, Non- dominant-hand, Grip strength

1. Introduction

In recent years, the improvement of science and technology made people's lives more convenient. In high-tech automated society today, hand works were never absent. Hands in life often did a variety of actions such as the grip, though it was not necessary with the maximum force whenever you grip, excessive force and repetitive movements produced muscle fatigue, and this could lead to injury or even raised the incidence of the disease [1]. The main reason of leading to the upper limb musculoskeletal disorders was usually excessive force [2, 3, 4]. In the past researches pointed out that power grip was the major reason of the upper limb musculoskeletal disorders [5,6]. Thus, working with hands was in the higher risk of damage than others [7, 8]. Science and technology also upgraded the medical technology to prolong human's average living age. Therefore, the proportion of elders got higher and higher every year so that the serious aging population society issue. Once elders were not able to act free and all they could do was lying on the bed, the effects were not only family burdens but also on elders own life. Aging was a natural phenomenon for human beings, that aging represented the degeneracy of organization and function of body.

Sarcopenia had a strong relationship with age. The phenomenon of degeneracy of muscle started around 30 years old, and after 60, it was going to be much more apparent [9]. For the elders over 65 years old in New Mexico U.S.A., male and female with sarcopenia took 28.5% and 33.9% proportion respectively [10]. Birrer also mentioned that people without regular exercising, the energy would lose gradually at the rate of

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0.75% every year, especially for people over 55-60 years old [11]. Moreover, the muscle mass lost gradually about 45 years old [12]. When being middle and elder age, it lost faster and more apparent. Mazzeo declared that 10% muscle disappeared at 50 years old and it became more and more after 50, 15% in 60-70, and 30% over 70 years old [13]. However, the muscle mass of female was less than male, the probability of suffering from sarcopenia and frailty was higher than male [14, 15]. If an elder did not have enough muscle, the functional activity would be degenerated and disabled, so that the risk of accident might increase [16]; moreover, the total mortality might increase, as well [18].

With the advancement of science, technology and medical technology, human's life was affected greatly. Hands were the most important part for a human being to work and live. People used them a lot and repeatedly everyday and were with aging on mental and physical degeneracy, so the loss was more and more. Therefore, in this article the relationship between dominant hand and non-dominant hand on grip strength in middle age & elder female would be discussed.

2. Methods

2.1. Subjects

65 right handed subjects over 55 years old in Chiayi were chosen in random. 65 subjects were divided into four groups by age. The first group was in age 55-60 (N=22), second group was in age 61-65 (N=16), the third group was in age 66-70 (N=14), and the final group was over 71 years old (N=13). All of the subjects were healthy and without any limb problems, serious damage and surgery before.

2.2. Implements



Fig.1: Dynamometer Model: WL-1000

2.3. Procedure

Correction of the space of handle would be applied before tests. Subjects held the dynamometer with space of bended second knuckle of finger under the handle. Hands hanged naturally, eyes look at the front and testers needed to relax the body, as well. With the maximum force every time in grip tests, subjects had to do the tests with dominant and non-dominant hand three times separately and chosen the best points as record. One minute break applied between every test.

2.4. Statistical Method

SPSS12.0 used in the study to gather statistics in one-way ANOVA to analyze the differences of the grip of the dominant and non-dominant hand. The level of significance set as $\alpha = .05$. If the significantly difference occurred, Schffe method would be operated to do the post hoc comparison ($p < .05^*$).

3. Results and Discussion

3.1. Conclusion

According to the above tables, the grip of dominant-hand in 55-60 and 66-70 years old had already reached the significantly difference, while the grip of non-dominant hand in 66-70 years old reached the significantly difference.

3.2. Discussion

In human's daily life, the major proportion of usage of hand was the dominant hand. Forcing with unilateral arm for a long time caused the imbalance or even more, the injury. With aging, the organization of muscle changed so that the muscle mass decreased and degenerated gradually. According to above three

tables, it was clear to see that the grip of dominant-hand in 66-70 years reaching the significantly difference than non-dominant hand did. The reason probably attributed to the working environment and the risk of danger of hands was higher than other parts of body [7,8]. Due to severely repetitious actions and the maximum force for a long time, muscle and tendon were not able to afford; therefore, the risk of upper limb musculoskeletal disorders rose [20,21]. The damage possibly caused by habitual usage of the dominant hand to force with unilateral arm in the subjects' early life, and caused by the muscle fatigue of severely repetitious actions. However, both aging and reducing of the activity of dominant hand because of damage made muscle mass decrease fast, in this way the self supporting ability affected the living quality. This might be the reason for the different rate of degeneracy between dominant and non- dominant hand. Moreover, muscle mass for female was less than male, and by aging the muscle mass decreased 1-3% every year. Both above reason resulted in female in menopause lack of body activity to keep self health²².

Table1: Description of middle-age and elder female

Group	Total	Height mean (cm)	Weight mean(kg)	BMI mean(kg/cm ²)
55-60(y)	22	157.54±6.58	62.77±8.25	25.28±2.87
61-64(y)	16	154.00±5.68	61.61±8.61	26.05±4.23
65-70(y)	14	153.86±6.60	57.49±11.22	24.18±3.74
70↑ (y)	13	153.53±4.57	55.49±7.21	23.68±3.90

Table2: Analysis of BMI of middle-age and elder female

	Project	SV	SS	DF	MS	Fo	p-Value
BMI	interaction	50.95	3	16.98	2.167	.101	
	error	805.51	61	13.20			
	total	856.46	64				

p < .05*

Table3: Grip analysis of dominant hand of middle-age and elder female

Project	SV	SS	DF	MS	Fo	p-Value	Schffe
Dominant hand grip strength	interaction	463.11	3	154.372	6.21	.001	55-60(y)>
	error	1515.04	61	24.837			66-70(y);
	total	1978.15	64				55-60(y)> 71(y)↑

p < .05*

Table4: Grip analysis of non-dominant hand of middle-age and elder female

Project	SV	SS	DF	MS	Fo	p-Value	Schffe
Non-dominant hand grip strength	interaction	332.73	3	110.91	3.82	.014	55-60(y)>
	error	500.459	61	29.07			71(y)↑
	total	5537.95	64				

p < .05*

4. Conclusions and Recommendations

Forcing with unilateral arm and severely repetitious actions produced muscle fatigue and got injury easily. Aging and lacking of body activity affected the power of hand by losing the muscle mass.

Hands should force equally to keep from imbalance in any work, and exercise can change the physical condition and slow down the aging of elders. Exercise did not only enhance self supporting ability but also cut the medical expense. Moreover, resistance training can increase muscle mass and bone density.

5. References

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