Radio Ulnar Joint Flexibility in Relation to Gender, Handedness and a Post-traumatic Wrist in Young Adult Males and Females in Rivers State

Ekokodje W. Joy and Olotu E. Joy
Department of Anatomy, College of Health Sciences, University of Port Harcourt, Rivers State, Nigeria

DOI: 10.29322/IJSRP.10.06.2020.p10250
http://dx.doi.org/10.29322/IJSRP.10.06.2020.p10250

Abstract: Radial and Ulnar deviation indicates distal radioulnar joint flexibility. It also is a reflection of the structure and function of the carpal bones, ulnar, radius and surrounding ligaments. The radioulnar carpal joint is very important for hand and wrist functions. This study evaluated the radial and ulnar deviation movements at the wrist at the wrist to ascertain if the range of these movements were affected by gender, handedness, and a post-traumatic wrist in young adult males and females residing in Rivers State. The study was a prospective research which utilized anthropometric measurements got with the aid of a goniometer. A total of 200 persons, comprising one hundred females, one hundred males were measured and data extracted to excel sheet. Statistical package for social sciences (SPSS, Version, IBM, Armonk, USA) was used to analyze the data. The results showed that the angle of radioulnar deviation in females to that of males showed that the mean angle of deviation in females on both hands was markedly increased compared to males and this was statistically significant (P-value > 0.05). Radioulnar deviation in both right and left handed persons showed not statistically significant difference (P-value < 0.05). For persons with post traumatic wrist no statistically significant difference in radioulnar deviation was seen for both hands when compared with that of apparently normal male and females wrists (P-value < 0.05). From the findings, it could be concluded that females have greater wrist flexibility than males as such wrist flexibility is affected by gender but not affected by handedness or post-traumatic wrists.

Keywords: Radioulnar joint, Flexibility, Gender, Handedness, Post-traumatic wrist, Rivers State.

INTRODUCTION

The distal radioulnar joint is important for hand and wrist function and the radioulnar deviation indicates distal radioulnar joint flexibility. It also describes hand movements towards the ulnar and radius and characterizes the entire radioulnar – carpal joint. Wrist joint flexibility is controlled by several bones and ligaments; the discuss articularis, the intercarpal ligaments and the volar and dorsal radiocarpal ligaments. The head of the ulnar, the ulnar notch of the radius, the distal end of the radius, and the lunate and scaphoid bones are also involved, whereas the styloid process of the ulnar and radius are responsible for impedance of lateral and medial movements at the wrist. Movements at the wrist joint are also determined by the shape and contour of contact surfaces and surrounding soft tissues.

The articular surface of the Ulnar, radius and carpal bones are engaged during many activities such as sports, manual work and playing of musical instruments. These surfaces are also affected by different fractures, and the range of radioulnar deviation indicates the flexibility of the radioulnar carpal joint. (Kitsoulis et al 2010). And since skeletal development is influenced by a number of factors producing differences in skeletal proportions between different geographical areas, it is desirable to have some means of giving quantitative expression to variations which such traits exhibit (Krishan, 2007).

This study, therefore sought to identify how certain factors like gender, handedness and a post – traumatic wrist affects radioulnar deviation at the wrist joint.

MATERIALS AND METHODS

The subjects for this study were all residents of Port Harcourt, Rivers State, in Nigeria. Subjects for the study were apparently healthy individuals. 100 males and 100 females with age ranging between 18 – 39 years, this was determined by interrogation. Individuals who showed any form of deformity of the hand and wrist were excluded from the study and random sampling method was used. The wrist dimensions measured were radial angle of deviation for right and left hand, ulnar angle of deviation for right and left hand. Maximum radioulnar deviation was measured using the method as described by Kapandji with the aid of a specially designed wooden goniometer (Kitsoulis, 2010). Only the maximum active (not passive) deviation was recorded.

Data entry was done using Microsoft Office Excel Version 10 and Statistical Analysis done using the Statistics Package for the Social Science Version 23.0. Data was presented in tables and charts. Results were extracted for the comparison between

groups. T-test was used here to test for the significance of the study. Charts used to represent the mean radioulnar deviations for all comparing groups, and P-value > 0.05 was considered significant.

Results

Right Ulnar Deviation (RUD) Among Comparing Groups

Variables	Mean angle of deviation	Standard deviation	Standard error
Female	48	11	1.1
Male	45	8	0.8
Right handed person	46	12	0.9
Left handed person	49	4	2
Persons with Post-traumatic Wrist	46	9	2.3

Left Ulnar Deviation (LUD)

Variables	Mean angle of deviation	Standard deviation	Standard error
Female	51	9	0.9
Male	47	11	1.1
Right handed person	49	9	0.6
Left handed person	54	4	2
Persons with Post-traumatic Wrist	53	6	1.5

Right Radial Deviation (RRS)

Variables	Mean angle of deviation	Standard deviation	Standard error
Female	35	7	0.7
Male	35	5	0.5
Right handed person	35	5	0.4
Left handed person	36	7	3.5
Persons with Post-traumatic Wrist	33	10	2.5

Right Ulnar Deviation (RUD)

Variables	Mean angle of deviation	Standard deviation	Standard error
Female	35	4	0.4
Male	32	7	0.7
Right handed person	33	6	0.4
Left handed person	36	7	3.5
Persons with Post-traumatic Wrist	32	8	2

T-test Result

Female Versus Male

Dimensions Measured	T-tabulated	T-calculated	Conclusion
Right Ulnar Deviation	+1.96	2.21	Significant P = 0.05
Left Ulnar Deviation	+1.96	2.82	Significant P = 0.05
Right Radial Deviation	+1.96	0	Significant P = 0.05
Left Radial Deviation	+1.96	3.70	Significant P = 0.05

Right Handed Versus Left – Handed Persons

Dimensions Measured	T-tabulated	T-calculated	Conclusion
Right Ulnar Deviation	+1.96	- 1.38	Significant P = 0.05
Left Ulnar Deviation	+1.96	- 2.38	Significant P = 0.05

Right Radial Deviation	+1.96	- 0.28	Significant P = 0.05
Left Radial Deviation	+1.96	- 0.72	Significant P = 0.05

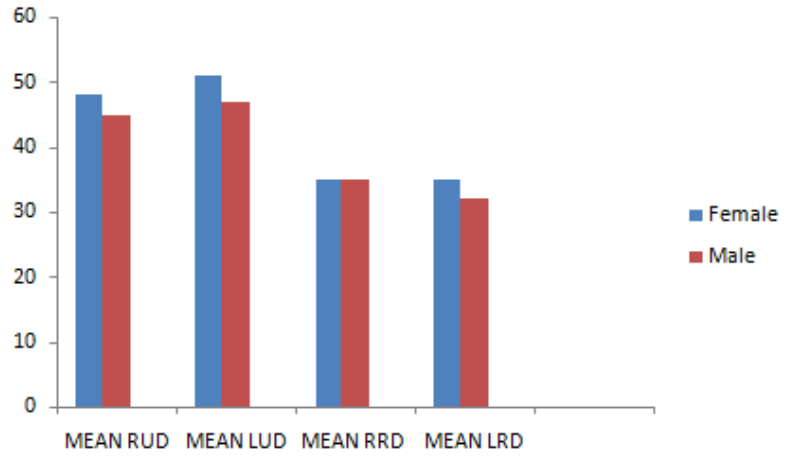
Apparently Normal Female Wrist Versus Females with Post-traumatic

Dimensions Measured	T-tabulated	T-calculated	Conclusion
Right Ulnar Deviation	+1.96	0.78	Significant P = 0.05
Left Ulnar Deviation	+1.96	- 1.12	Significant P = 0.05
Right Radial Deviation	+1.96	0.75	Significant P = 0.05
Left Radial Deviation	+1.96	1.43	Significant P = 0.05

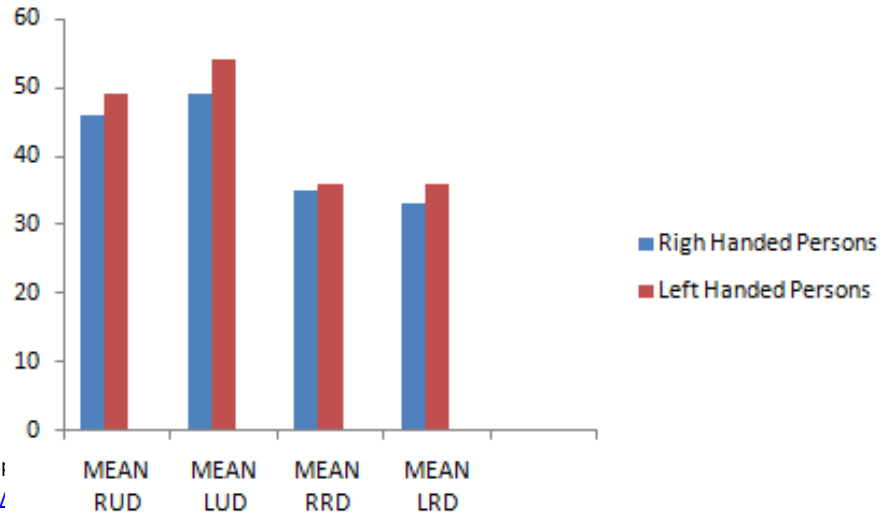
Apparently Normal Male Wrist Versus Males with Post-traumatic Wrist

Dimensions Measured	T-tabulated	T-calculated	Conclusion
Right Ulnar Deviation	+1.96	0.14	Significant P = 0.05
Left Ulnar Deviation	+1.96	3.16	Significant P = 0.05
Right Radial Deviation	+1.96	0.76	Significant P = 0.05
Left Radial Deviation	+1.96	0	Significant P = 0.05

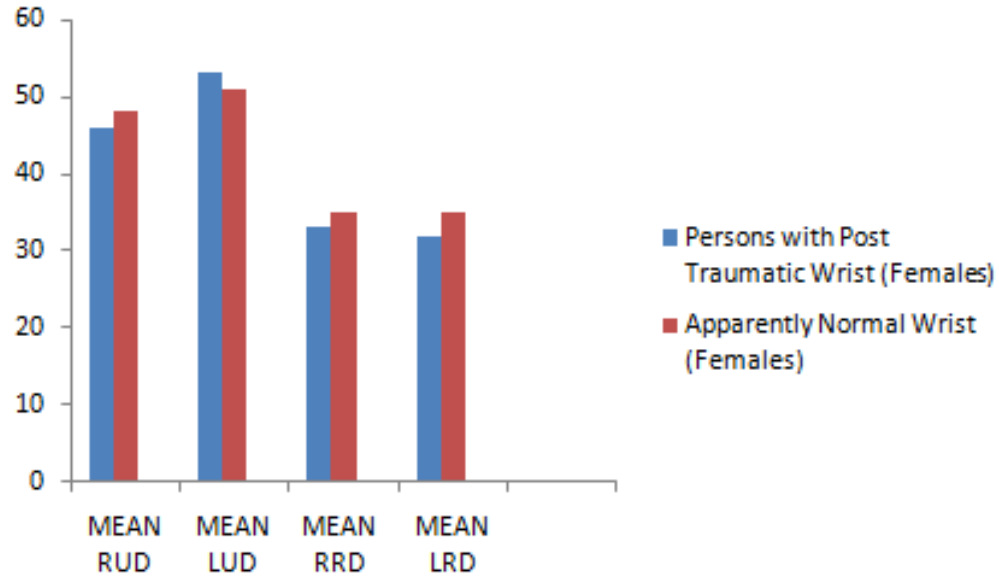
Mean angle of deviation in females versus males
RUD, LUD, RRD, LRD,
Female = Blue
Male = Red



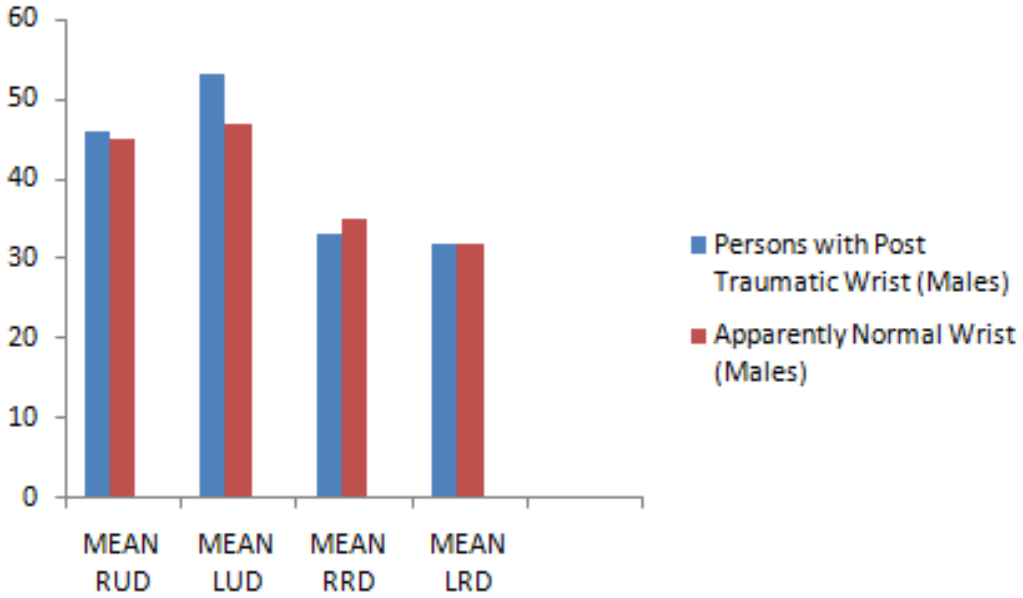
GRAPH 1: FEMALE VERSUS MALE (MEAN ANGLE OF DEVIATION)



GRAPH 2: RIGHT HANDED VERSUS LEFT HANDED PERSONS (MEAN ANGLE OF DEVIATION)



GRAPH 3: PERSONS WITH POST TRAUMATIC WRIST VERSUS APPARENTLY NORMAL WRIST (FEMALES)



GRAPH 4: PERSONS WITH POST TRAUMATIC WRIST VERSUS APPARENTLY NORMAL WRIST (MALES)

DISCUSSION

This study sought to identify factors affecting radioulnar deviations in persons within the age of 18 – 37 years. Radial and ulnar deviation of both hands were compared among the different groups been studied.

Comparing the angle of radio ulnar deviation in females to that of males showed that females right and left hand mean angle of deviation was markedly increased and this was statistically significant at $P > 0.05$. Only the mean right radial deviation showed no statistical difference. Thus radio-ulnar deviation was affected by gender. This is unlike previous studies done by

Kitsoulos where it was found that no statistically significant difference existed in the radioulnar deviation between men and women.

Kitsoulis also found out that the radial and ulnar deviation at the wrist was not affected by handedness. This agrees with findings in this study were radioulnar deviation in both right and left hand of right handed persons when compared to that of left handed persons, showed no statistically significant difference (P-value < 0.05).

For persons with post – traumatic wrist no statistically significant difference in radioulnar deviation for both hands were seen when compared to that of apparently normal males and females (P-value < 0.05) and this included all wrist deviations in the comparing groups. Like studies done by Kitsoulis radial and ulnar deviation at the wrist are not affected by previous fracture or inflammation. The findings for this study and that done by Kitsoulis tend to contradict those of previous studies done by Tornvall et al, were it was found that a history of inflammation or fractures to the wrist reduced radioulnar deviation each by approximately ten (10) degrees. In all, the mean radial deviation for the present study was 34 degrees, whereas the mean ulnar deviation was 50 degrees to the nearest whole number. Like other anthropometric parameters it is worthy of note that differences in the measured dimensions that occurred will also occur between members of the same population as well as people occupying different geographical locations and also among different races.

The disparity in the measured variables among males and females when compared with past studies could be as a result of the distinct methodology used to ascertain radioulnar deviation. And in turn wrist flexibility. Also this study showed that in both male and female groups comparing the radioulnar deviations of persons with post – traumatic wrist to those of apparently normal females and males no statistically significant differences was noticed. Previous findings by Kazuki showed decrease of approximately 10 (ten) degrees in radial and ulnar deviation of persons with previous collies fracture, inflammation and previous arthrodesis. The differences in the findings when compared to this present study may be attributable to the fact that the present study included a younger population of persons, in whom bone ossification may not have been completed or the effect of injury severity will be less compared to older persons.

CONCLUSION

From the findings, females can be said to have higher wrist flexibility than males due to some anatomical differences that may exist between men and women. No differences in wrist flexibility was seen between right-handed and left-handed persons. Also a post – traumatic wrist does not affect radioulnar deviation and in turn wrist flexibility. Most likely, it could be as a result of the young age group included in the study. In conclusion therefore, wrist dimensions can and should be incorporated as standards for measuring the degree of body flexibility and more precisely wrist flexibility. And more so when it relates to particular jobs where hand motion are greatly involved in accomplishing work speed.

REFERENCES

Abrahams, P.H.; Marks, S.C.; Hutchings, R.T. (2003). Hand, Clinical notes. McMinn's colour Atlas of Human Anatomy. Fifth Edition. Mosby Publications. Page 158-176.

Adams, B.J.; Byrd, J.E. (2002). Interobserver Variation of Selected postcranial skeletal measurements. Pubmed Publications Volume 47. Number 6.

Aydog, S.; Keskin, D.; & Ogut, B. (1994). Rehabilitation after Colles' fracture. *Journal of Islamic Academy* of Sciences. Volume 7 number 4. Page 247-250.

Byran, C.H. (2010). Pathophysiology of the wrist fractures. Clinical orthopaedics and related research. Pubmed Publication.

Chummy, S.S. (2006). Wrist and Hand. Last's Anatomy. Eleventh edition. Churchill Livingstone. Elsevier Publishers. Page 75-81.

Dum, Y.; McMurthy, R.Y.; Flatt, A.E.; Gillespie, T.E. (1998). Kinematics of the wrist. An experimental study of radioulnar deviation and flexion-extension.

Kakar, S.; Kumar Dinesh (2000). Radial and Ulnar Deviation of the Wrist in Young Adult Females. Journal of Anatomical Society of India. Internet Scientific Publication. Volume 49 number 1. Page 13-16.

Keith, L. M, [1992]: The Upper Limb. Clinically Oriented Anatomy. Third edition, Williams and Wilkins Publishers. Page 591-593.

Kitsoulis, P.; Panagoitis (2010). Clinical study of factors affecting radioulnar deviation at the wrist joint. Published by Biomed Central.

Krishan, K. (2007). Anthropometry in Forensic Medicine and Forensic Science. *The Internet Journal of Forensic Science*. Internet scientific Publication. Volume 2 number 1.

Lamoreaux L.; Hoffer, M.M. (1995). The effect of Wrist deviation on grip and pinch strength. Clinical orthopaedics and related research. Pubmed Publications.

Nancy Roper (1998). Churchill Livingstone pocket medical dictionary. Fourteenth edition. Published in association with The Royal Society of Medicine.

Romans G. J. (1996). The Muscles, movements, and nerves of the upperlimb. Cunningham's manual of Practical Anatomy. Fifteenth edition .Oxford Medical Publications. Volume 1. Page 117-118.

Soni, (2006). Ergonomics and its relationship with anthropometry.