

2009-01-01

Comparison Of Older Mexican American Upper Extremity Reach Capabilities To Older Anglo Americans

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CO COMPARISON OF OLDER MEXICAN AMERICAN UPPER EXTREMITY
REACH CAPABILITIES TO OLDER ANGLO AMERICANS

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Dedicated to my other half, Lauren.

COMPARISON OF OLDER MEXICAN AMERICAN UPPER EXTREMITY
REACH CAPABILITIES TO OLDER ANGLO AMERICANS

By

Odi Mike Ikpe, Bachelor of Science

THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Science

Department of Industrial Engineering

THE UNIVERSITY OF TEXAS AT EL PASO

August 2009

ACKNOWLEDGEMENTS

I thank my Lord for his mercy and countless blessings. I am most grateful for the sacrifices my parents Dr. Mike and Esther Ikpe made for me, I am indeed the product of their hard labor. My brothers Mandu, Akan and Dr. Ini remain my love and serve as my daily inspiration.

I would like to thank Dr. Golding and Dr. Contreras for serving on my committee and assisting me in my transition to UTEP. Most importantly, I would like to thank Dr. Pennathur for serving as thesis advisor and mentor. Dr. Pennathur has truly changed my life and taught me so much, in a way I forever feel indebted to him.

ABSTRACT

The study aimed to investigate if there are upper extremity reach capability differences in older Mexican Americans and older Anglo Americans. The subjects were recruited and corresponded to the 2000 census track. Upper extremity reach capability was determined by analysis of 20 range of motion variables. A MANOVA analysis utilizing SPSS software was performed with age, gender and ethnicity as independent variables while height and 20 range of motion anthropometric measurements servings as dependent variables (responses). Ethnicity as a function of age was found to be significant in height, horizontal distance from buttock to hand, rotation of head to the right and left, extension and flexion of the head, lateral and medial rotation of shoulder, abduction and adduction of the shoulder, extension of the shoulder and flexion of elbow at 5 % alpha levels.

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Chapter 1

INTRODUCTION

1.1 Definition of Anthropometry

Anthropometry is the measurement of human physical form (Kroemer, 1994) and the art of application that establishes the physical geometry, mass properties, and strength capabilities of the human body (Del Prado-Lu, 2007). Anthropometric data can be measured longitudinally or cross-sectional. Longitudinal data provides consistent measurements of a particular group or individual by making measurements after a lapse of a predefined period for a certain duration. On the other hand, cross sectional data measures a group average at a given point in time. Though the former approach provides the best indication of anthropometric changes, the latter approach is more frequent in the literature most likely due to its economical and feasibility advantages. Some common anthropometric measurements include (1) forward fingertip reach ; (2) overhead fingertip reach; (3) forward grip reach; (4) overhead grip reach; (5) lower hand height; (6) upper hand height; (7) maximum overhead fingertip reach angle; (8) horizontal distance from buttock to hand; (9) vertical reach distance; (10) arm span; (11) extension of head; (12) flexion of head; (13) maximum rotation of the head; (14) flexion and extension of the shoulder; (15) abduction and adduction of the shoulder; (16) lateral and medial rotation of the shoulder.

1.2 Aging

Physical age has served as the most reliable predictor of aging. However, people of the same physical age may age differently due to the various factors that affect aging. Aging is a normal process characterized by typical, functional and morphologic changes indicative of age related changes in the body. The only experience that humans share beside birth and death is aging. Some people have better quality of life than others. The term aging is referred to a process or a group of processes occurring in living organisms that with the passage of time lead to a loss of adaptability, functional impairment, and eventually death (Spirduso, 1995).

Though we all age, the manner rates at which people age differs. Low probability of disease and disease related disability, high cognitive and physical functional capacity and active engagement with life are the three components to successful aging. The three components are further broken down into subsets and the interaction between the various factors is what determines one's aging (Rowe, 1997).

1.3 Older Adult Population

In this research the older adult population will refer to people aged 65 and above. In 2011 the first baby boomers will turn 65, ushering in a new generation of older Americans. The 65-and-older population of the future will be markedly different from previous generations, with higher levels of education, lower levels of poverty, more racial and ethnic diversity, and fewer children. Their most striking characteristic, however, will be their numbers. The aging of the baby boom population (The baby boomer refers to people born in the post-World War II period from 1946 through 1964), combined with an increase in life expectancy and a decrease in the

relative number of younger people, will create a situation where older adults make up a much larger percentage of the U.S. population than has ever before been the case. Between 2005 and 2030 the number of adults aged 65 and older will almost double, from 37 million to over 70 million, accounting for an increase from 12 percent of the U.S. population to almost 20 percent (Retooling, 2008).

In July 2003, 35.9 million people were aged 65 and older in the United States, or 12 percent of the total population. Among the older population, 18.3 million people were aged 65 to 74, 12.9 million were aged 75 to 84, and 4.7 million were 85 and older. In 2003, non-Hispanic Whites accounted for nearly 83 percent of the older population. Blacks, Asians, and Hispanics accounted for 8 percent, 3 percent, and 6 percent, respectively. Projections indicate that by 2030, the composition of the older population will be more diverse: 72 percent non-Hispanic White, 11 percent Hispanic, 10 percent Black, and 5 percent Asian. The older Hispanic population is projected to grow rapidly, from just over 2 million in 2003 to nearly 8 million in 2030 (He, 2005).

1.4 Disability in Older Adults

Disability is a complex phenomenon to define. The 1990 Americans with Disabilities Act defines disability as a physical or mental impairment which substantially limit one or more of an individual's major activities of daily livings such as walking, hearing, speaking, learning and performing manual tasks. The World Health Organization defines disability as any restriction or lack of ability to perform an activity in the manner, or in the range, considered normal. Studies

show that the variations of disability statistics is a result of varying disability definitions (Levine, Zitter, and Ingram, 1990; Gardner- Bonneau, 1990).

According to a National Health Interview Survey, the disability rate among people ages 18 to 59 rose significantly from the 1980s through the 1990s, with the growing prevalence of obesity an important factor in this trend. Obesity and overweight put people at increased risk for potentially disabling chronic diseases such as heart disease, type 2 diabetes, high blood pressure, stroke, osteoarthritis, respiratory problems, and some forms of cancer.

Research demonstrates that disease and disability are not an inevitable part of aging (Fried, 1997). Disability rates can be reduced, as evidenced by data from the National Long Term Care Survey, which found that between 1982 and 1999, the prevalence of physical disability in older Americans decreased from 26 percent to 20 percent. Factors thought to have contributed to this decline in disability rates include improved medical treatment, positive behavioral changes, more widespread use of assistive technologies, rising education levels, and improvements in socioeconomic status(National Institute of Health). Analysis of anthropometric measurements could eventually serve as predictors of future states of disability and provide an early avenue for intervention. Furthermore, anthropometric measurements can be utilized at early design stages in order to produce better products.

1.5 Organization of Thesis

The first chapter introduces gives an overview of anthropometry, aging, older population and disability among older adults. The second chapter is back ground section which reviews the literature on the various topics including the findings of the relationship between Anthropometry and Age, Upper Extremities Anthropometry, Duke OARS, and the validity of Self Reported

Assessments. My research objectives are defined in chapter three. In chapter four, I explain my research methodology while describing the data origin and design of experiment. The fifth chapter compiles the results of my experiment. Chapter 6 concludes with an explanation and analysis of my results.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

Samples of most anthropometric surveys are exceedingly small and the surveys do not distinguish between ethnic origin, region, socioeconomic status, health and other attributes that are codeterminants of anthropometry (Kroemer, 1994).

2.2 Anthropometry and Age

There has been much research done to understand the relationship between age and anthropometry. Perissinotto et al. state that anthropometric measurements serve as an essential tool in geriatric nutritional assessment to evaluate underweight and obesity conditions (2002) which are both important factors for severe diseases and disability in the elderly (Jensen, Roger, 1998; Visser et al. 1998).

The most apparent anthropometric measurement affected by age is height. There is about a 1cm decline in height per decade lived and this may be a result of (a) flattening of the cartilaginous disks between the vertebrae; (b) a flattening or thinning of the bodies of the vertebrae; (c) a general thinning of all weight- carrying cartilages; (d) a change in the S- shape of the spinal column in the side view, particularly an increased kyphosis in the thoracic area (hump back); (e) in some cases, scoliosis, a lateral deviation from the straight line displayed by the

spinal column in the frontal view; and (f) possibly bowing of the legs and flattening of the feet (Barlow, Braid 1990; Stoudt, 1981).

2.3 Upper Extremities Anthropometry

Upper extremities anthropometric measurements are generally used to evaluate reach capabilities. They are good indications of upper body range of motion. Body Measurements are usually defined by two end points of distanced measured (Kroemer, 1994). Anthropometric measurements can be measured statically or functionally. Static anthropometry is the measurement of body dimensions with the body held in standardized, static postures. In contrast, functional anthropometry is the measurement of the limits of movements of the human body.

Findings by James Prichett (1988) suggest that accurate predictions of growth and of growth discrepancy in the upper extremity can be made and the time at which to perform equalization procedures can be determined more precisely. He adds that the human body is generally thought of as a symmetrical structure. Prichett states that while a small difference in the lengths of the extremities is not a functional problem, larger discrepancies may lead to physically disability and emotional distress. Mild inequalities in the length of the upper extremities are well tolerated but larger differences may pose problems. Anthropometric measurements have rarely been used to study growth in the upper extremities (Prichett, 1998).

2.6 Duke OARS and Validity of Self Reported Assessments

The Duke University Center for the Study of Aging and Human Development developed OARS, which includes an assessment of personal functioning in five domains: social, economic, mental health, physical health, and self-care capacity. A summary rating is calculated for each of the domains that ranges from excellent functioning (1) to totally impaired (6) (Fillenbaum & Smyer, 1981). Previously, a test–retest reliability trial showed that 91% of items were identical after a 5-week interval, and an intrarater reliability trial demonstrated that 80% of intrarater correlations were 0.8 or higher (Fillenbaum, 1988). Although other domains in OARS have been previously assessed for validity, the social resource component was not examined, as an external standard of comparison was not identified (Burholt, 2007).

Burholt et al. performed a study to examine data quality, reliability, and construct validity of the Older Americans Resources and Services social resources scale. They assessed the measurement equivalence of the OARS social resources measure by examining reliability (internal consistency), item–total correlations, and the construct validity of underlying dimensions. They then used confirmatory factor analysis to determine the applicability of the factor structure of the OARS social resources scale. Their study was performed across multiple countries and supports other findings which highlight the complexity of social structure. Varying ethnic group have different social resources and this is particularly the case in Anglo Americans and Mexican Americans. Furthermore, studies do suggest that social resources have multiple dimensions (Hall & Wellman, 1985; Wellman, 1988).

Chapter 3

RESEARCH OBJECTIVES

3.1 Research Objectives

Anthropometric variability can be attributed to ethnicity, gender and age differences (Jurgens et al., 1990). The anthropometric differences between older Mexican Americans and their older Anglo American counterparts are yet to be assessed. Intervention to allow for successful aging is an important issue especially since the near future promises an unforeseen aging population with a significant percentage being older Mexican Americans. An intervention to slow or circumvent effects of aging can occur medically or through engineering. Engineering interventions typically involves redesign of the built environment to support graceful aging (Pennathur, 2007). Before engineering designs can be implemented, it is important to understand the users of the proposed design. In regards to design for an aging population, engineers need to know if the varying ethnic population have different anthropometric measurements and assess how or if that will affect their designs. Incorporating anthropometric data in the design stage would yield more efficient designs, ones that are more user friendly, safer and enable higher performance and productivity (Ali, 2009). Improved design in the built environment will ultimately increase the quality of life especially in older adults.

Reach capabilities determine range of motion and studies have shown that reach capabilities affect older adults' ability to perform activities of daily living (Pennathur, 2003). I aim to investigate whether older Mexican Americans have different reach capabilities than their Anglo American counterparts.

Chapter 4

RESEARCH METHODOLOGY

4.1 Introduction

Though the concept of “quality of life” is complex, subjective and multidimensional (Felce, 1995), I believe it is quantifiable. Quantification of “quality of life” is necessary because nothing can be improved without first measuring it. I define quality of life as one’s ability to successfully perform activities of daily living with minimal or no assistance. There is a correlation between independence and quality of living. Studies suggest that people associate a better quality of life in regards to their ability to perform activities of daily living (Ulander, 1997; Goldstein, 2003; Schoenmakers, 2005).

The data utilized in my experiment were acquired by investigators headed and coordinated by Dr. Arunkumar Pennathur. Below describes the selection criteria and population description. I will measure functional reach capabilities through anthropometric measurements, specifically upper extremity reach capability. Upper extremity reach capability will be measured by height and 20 other range of motion measurements. Self reported responses of the Duke Older American Resources and Service questionnaire filled out by both the older Mexican American and Anglo American sample groups will also be assessed.

4.2 Participants

Study participants: The investigators had established a successful working relationship with the Aging Services of the City of El Paso and the El Paso Housing Authority, through Ms. Winifred

Dowling, Aging Services Administrator for the City of El Paso. Mexican American older adults were recruited from retirement community dwellings in El Paso through the assistance of the Aging Services Administration in El Paso. The El Paso Aging Services Administration coordinated access to participants from the Retired Senior Volunteer Program (RSVP). Based on the 2000 Census data (documenting the distribution of older Mexican American adults living in El Paso), and a map of the census tracts in El Paso, the investigators determined the proportion of older Mexican American men and women to be included in the study from each census tract (to add to a total of 125 men and 125 women in the study). After this determination of desired proportional sample sizes from each census tract, the investigators coordinated with the aging services administration's RSVP list and provided a random list of selected participants from each census tract. The RSVP program coordinators then provided contact information for several potential recruitment points throughout El Paso. The investigators then contacted the recruitment center coordinators by phone, and set up orientation meetings and field data collection meetings for the research. All older adults participating in the study were required to be physically active individuals independent of walkers, wheelchairs, or canes, and must not have had any serious debilitating disease. All older adults signed informed consent forms and were free to withdraw from the study at any time.

Measurement Protocols and Equipment: All functional anthropometric reach dimensions were measured using various anthropometers and scales available at the Ergonomics, Safety and Productivity Applications Laboratory at UTEP.

Below are the anthropometric variables measured;

1. Height: vertical measurement from top of head to floor.

2. O.F.R. - Overhead Fingertip Reach: performed standing and measured vertically from the floor to the tip of the middle finger.
3. O.G.R. Overhead Grip Reach: performed standing and measured horizontally from vertical wall to center of a rod gripped vertically in the hand.
4. Arm Span: fingertip to fingertip, measured horizontally from the tip of the middle finger on one hand to the tip of the middle finger on the other hand.
5. U.H.H. - Upper Hand Height: performed standing and measured as the vertical distance from floor to knuckle of middle finger of left hand at a distance of 360 mm from chest.
6. L.H.H. - Lower Hand Height: performed standing and measured as the vertical distance from floor to knuckle of middle finger of left hand at a distance of 360 mm from chest.
7. V.R.D. - Vertical Reach Distance: maximum overhead fingertip reach angle measured standing with subject standing erect, with weight as evenly balanced as possible, and arm extended vertically above head and hand and fingers held straight.
8. H.D.F.B.H. - Horizontal Distance From Buttock to Hand: horizontal distance from buttock to hand when bending forward and downward measured horizontally from buttocks to tip of middle finger of left hand.
9. F.F.R - Forward Fingertip Reach: performed standing and measured horizontally from a vertical wall to the tip of the middle finger.
10. F.G.R - Forward Grip Reach: vertical reach distance when bending forward and downward measured vertically from floor to tip of middle finger of left hand.
11. R.H.R - Rotation of the Head to the Right: maximum rotation of the head to the right (in degrees) will be measured with the subject sitting upright and rotating the head to the

right while looking forward; the angle from the horizontal reference point (zero start position) to the line from the back of the head through the nose will be measured.

12. R.H.L - Rotation of the Head to the Left: maximum rotation of the head to the left (in degrees) will be measured with the subject sitting upright and rotating the head to the left while looking forward; the angle from horizontal reference point (zero start position) to the line from the back of the head through the nose will be measured.
13. F.H - Flexion of Head: flexion of head (in degrees) will be measured as the maximum forwards bending of the head; the angle from the vertical reference point (zero start position) to the fixed line in front of the ear will be measured.
14. E.H - Extension of Head: extension of head (in degrees) will be measured as the maximum backwards bending of the head (extension).
15. L.R.S - Lateral Rotation of the Shoulder: lateral rotation of the shoulder (in degrees) will be measured as the maximum rotation of the shoulder.
16. M.R.S. - Medial Rotation of the Shoulder: medial rotation of the shoulder (in degrees) will be measured as the maximum rotation of the shoulder.
17. Ab. S. - Abduction of the Shoulder: abduction of the shoulder (in degrees) will be measured as the maximum range of motion of the shoulder in the coronal plane (side to side) of the body.
18. Ad. S - Adduction of the Shoulder: adduction of the shoulder (in degrees) will be measured as the maximum range of motion of the shoulder in the coronal plane (side to side) of the body.

19. F.S - Flexion of the Shoulder: flexion of the shoulder (in degrees) will be measured as the maximum range of motion of the shoulder in the sagittal plane (front to back) of the body.
20. E.S - Extension of the Shoulder: extension of the shoulder (in degrees) will be measured as the maximum range of motion of the shoulder in the sagittal plane (front to back) of the body.
21. F.E - Flexion of the Elbow: flexion of the elbow (in degrees) will be measured as the maximum flexion and extension of the elbow.

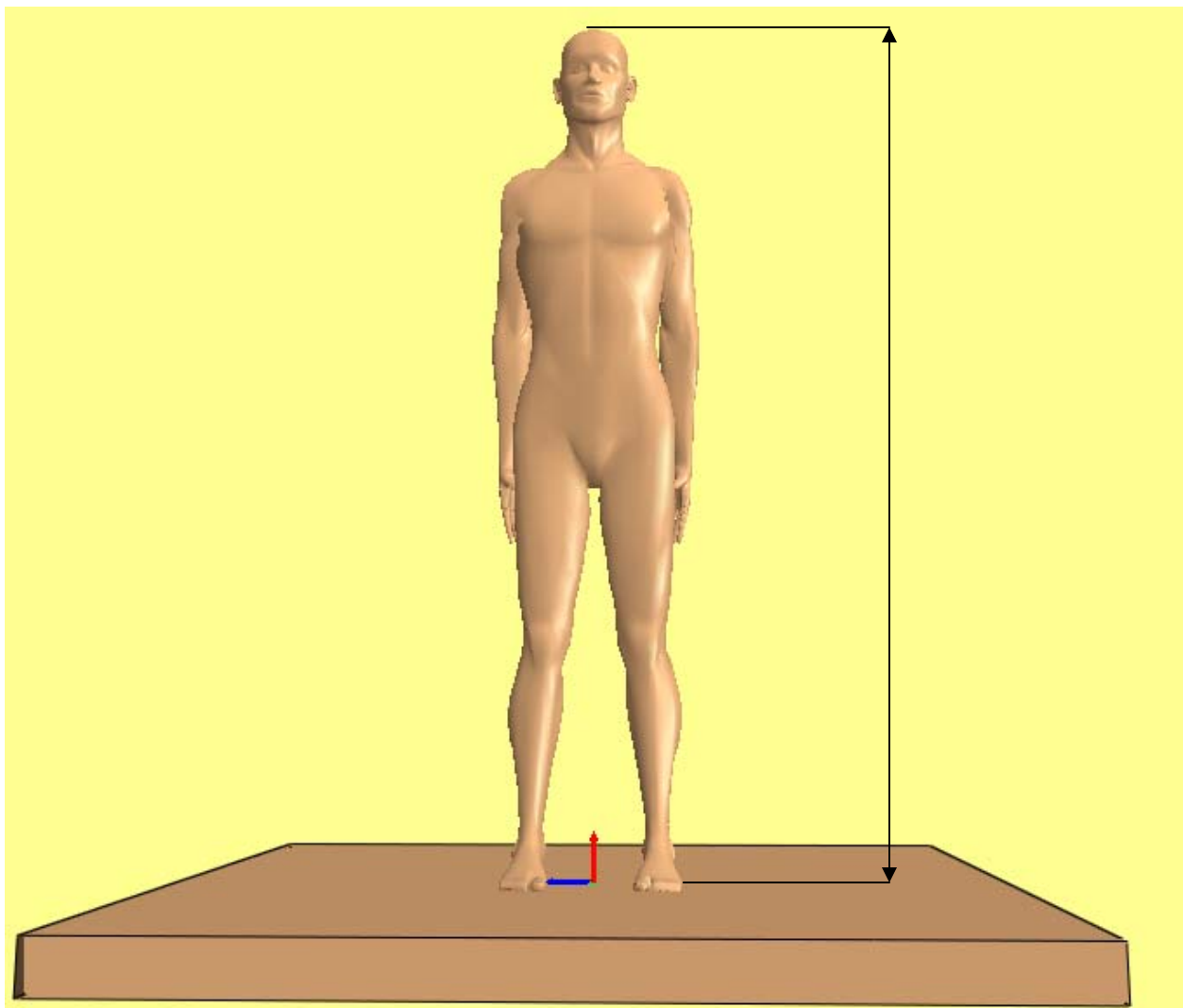


Figure 1: Height

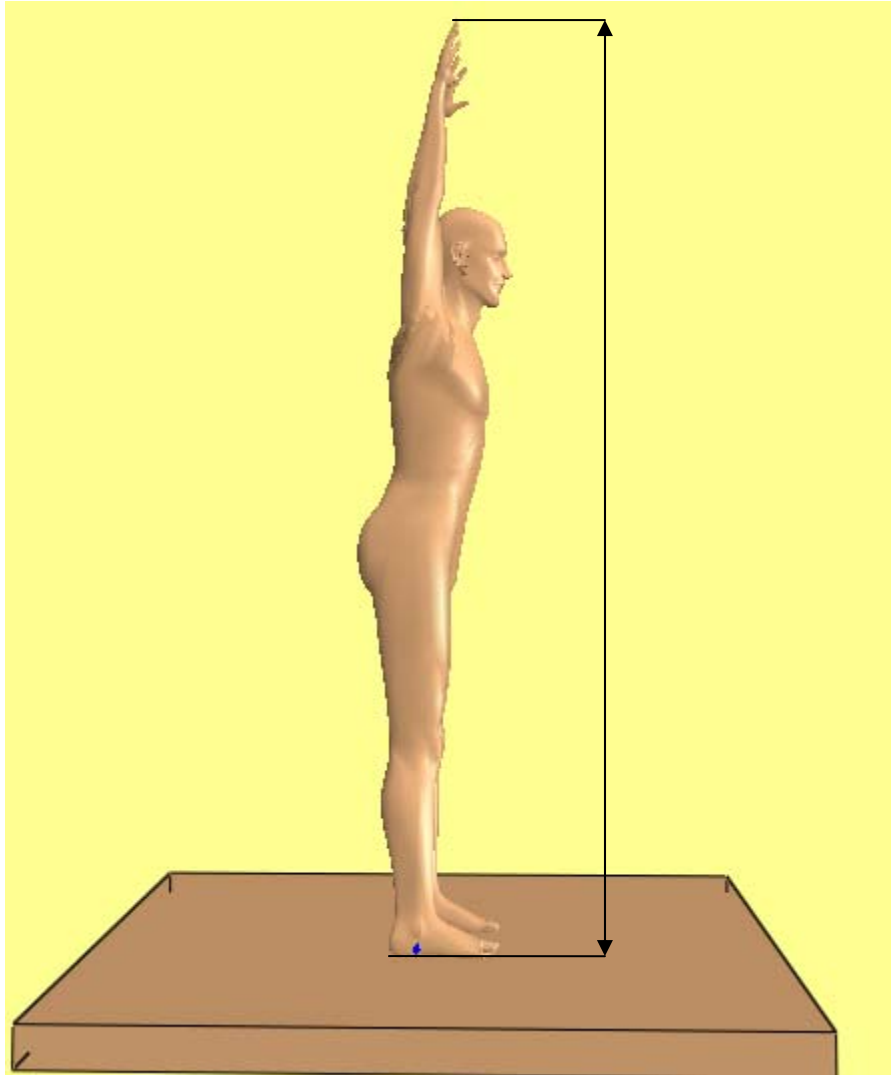


Figure 2: overhead fingertip reach

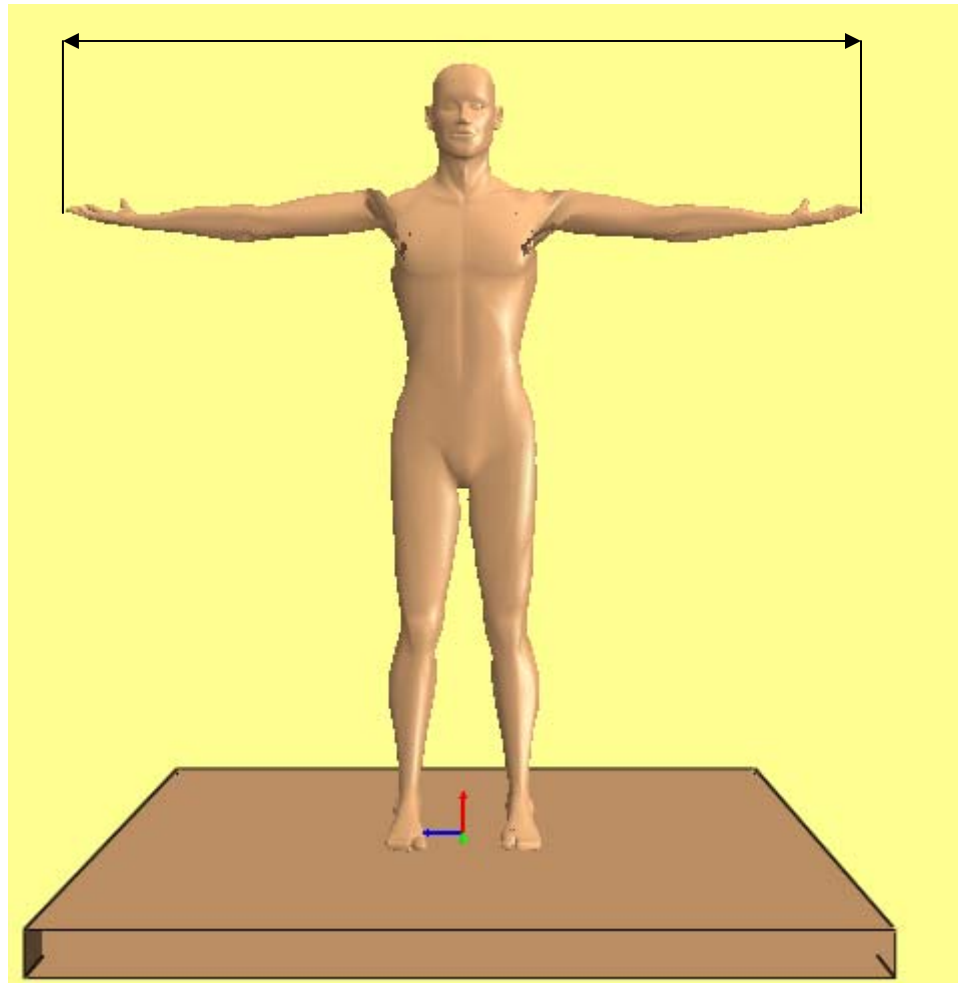


Figure 3: arm span

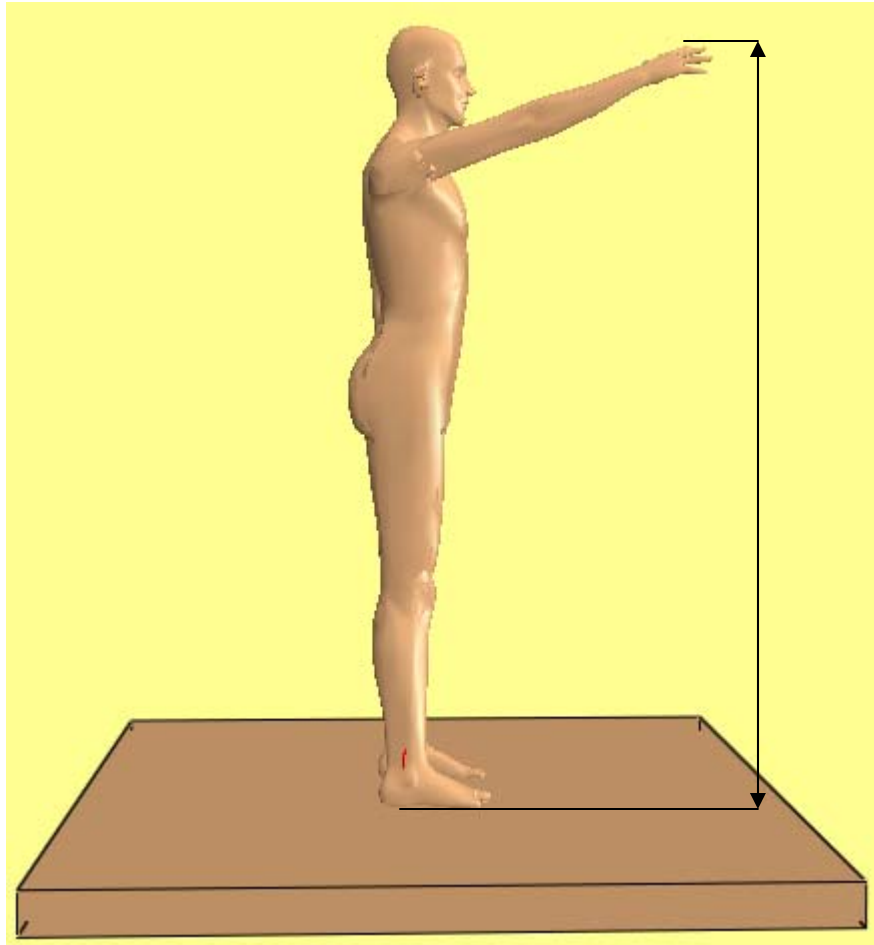


Figure 4: upper hand height

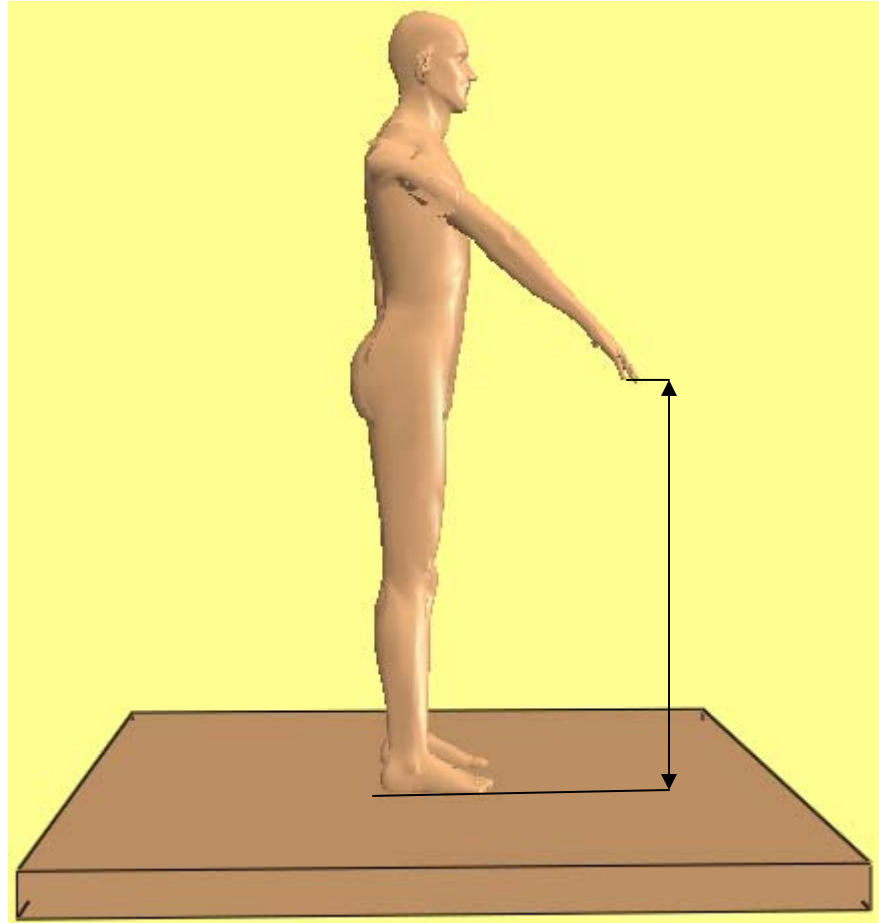


Figure 5: lower hand height

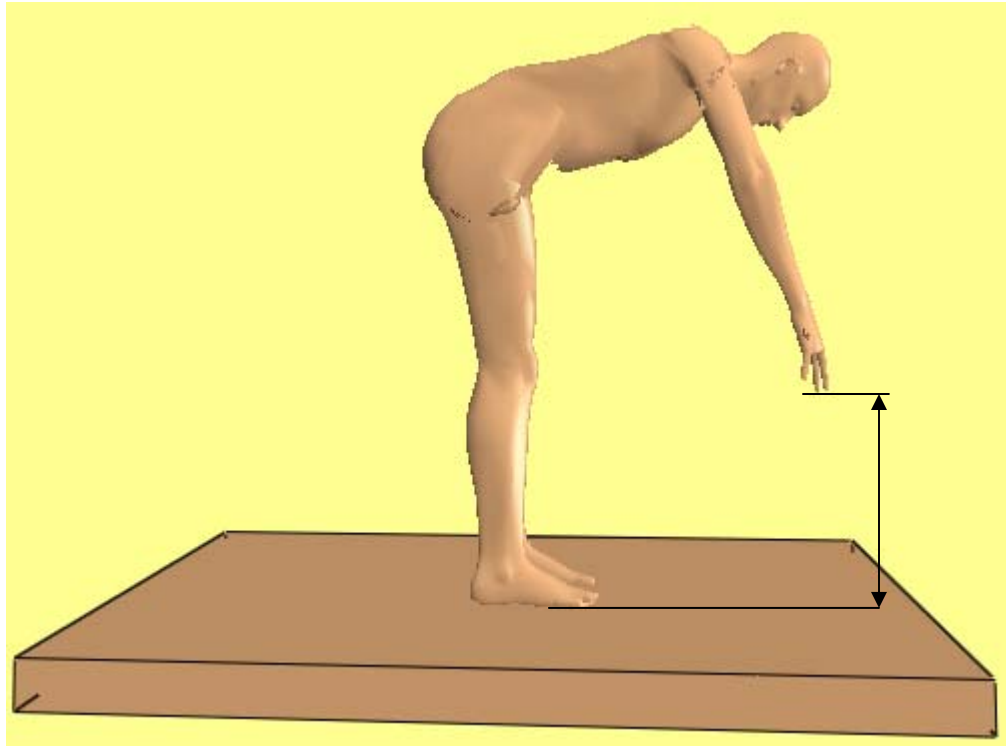


Figure 6: vertical reach distance

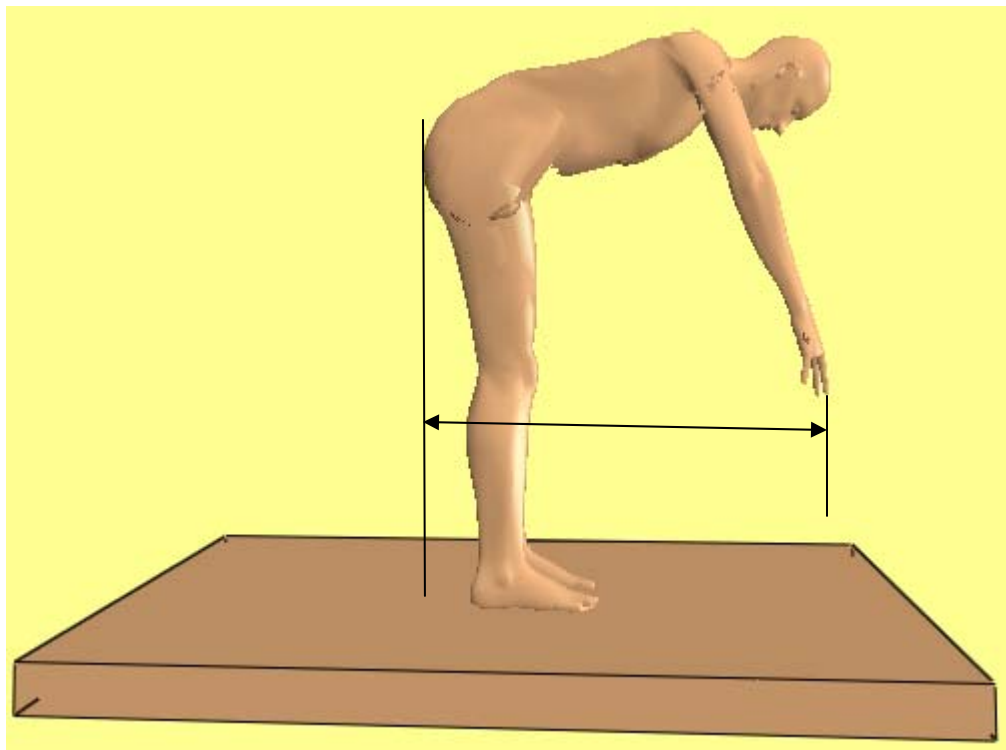


Figure 7: horizontal distance from buttock to hand

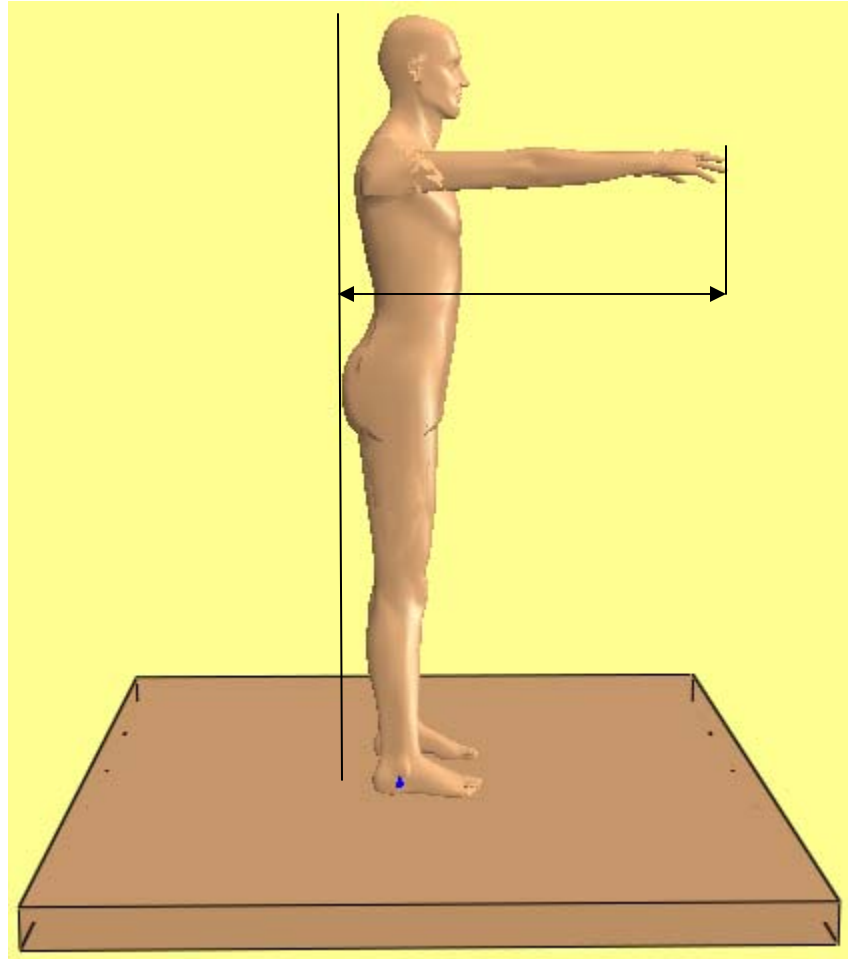


Figure 8: forward fingertip reach

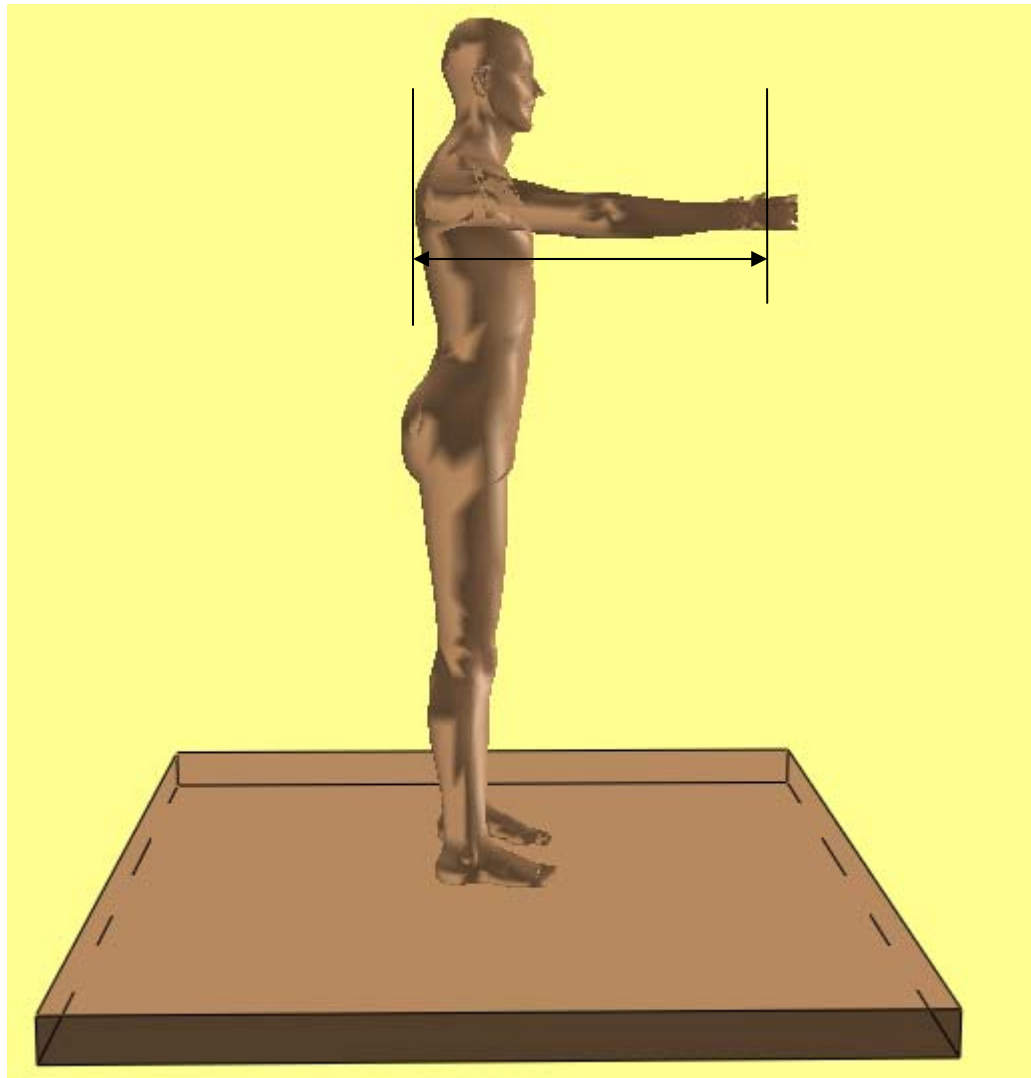


Figure 9: forward grip reach

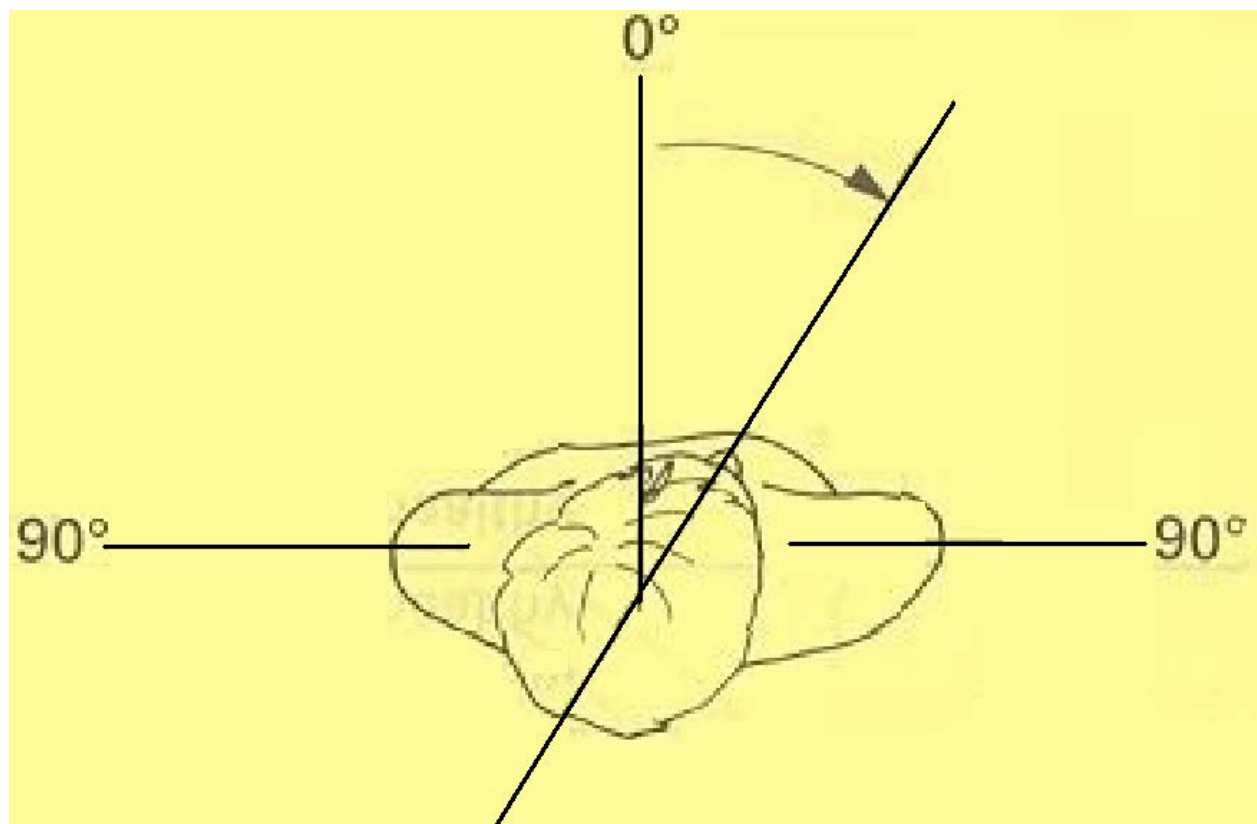


Figure 10: rotation of the head to the right

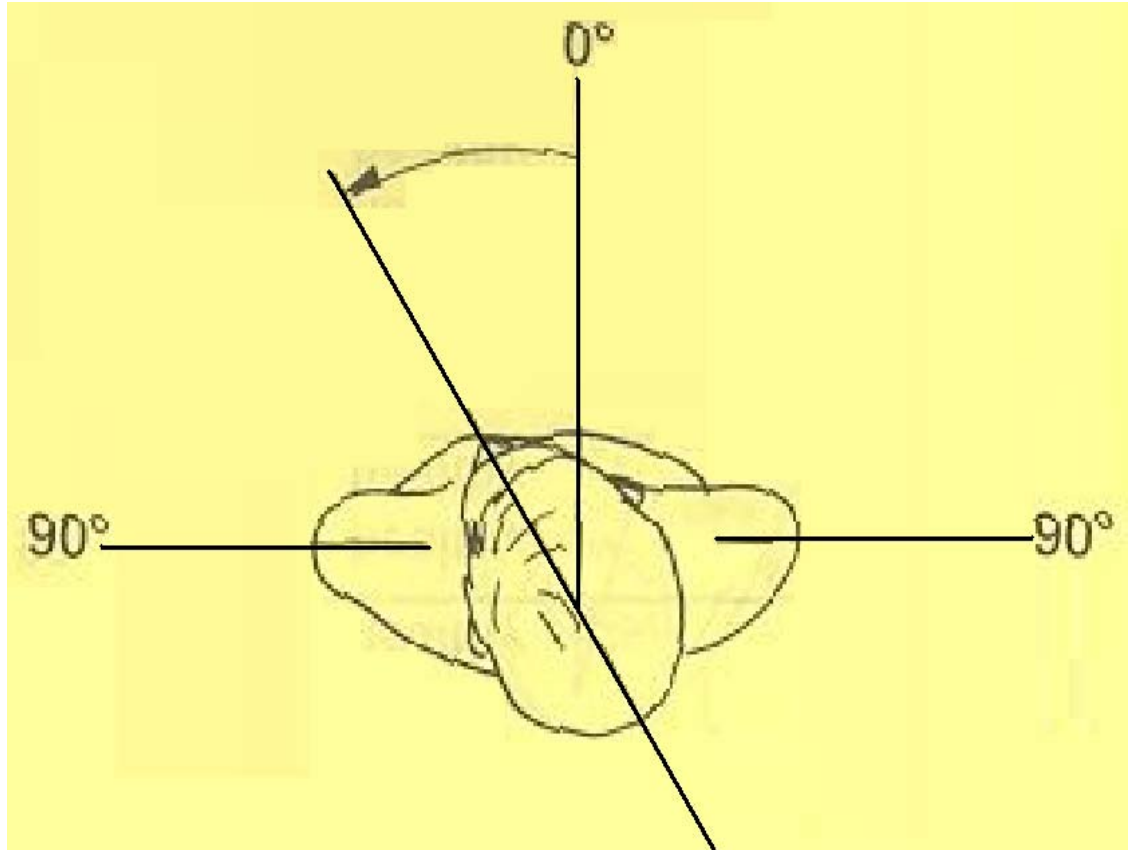


Figure 11: rotation of the head to the left

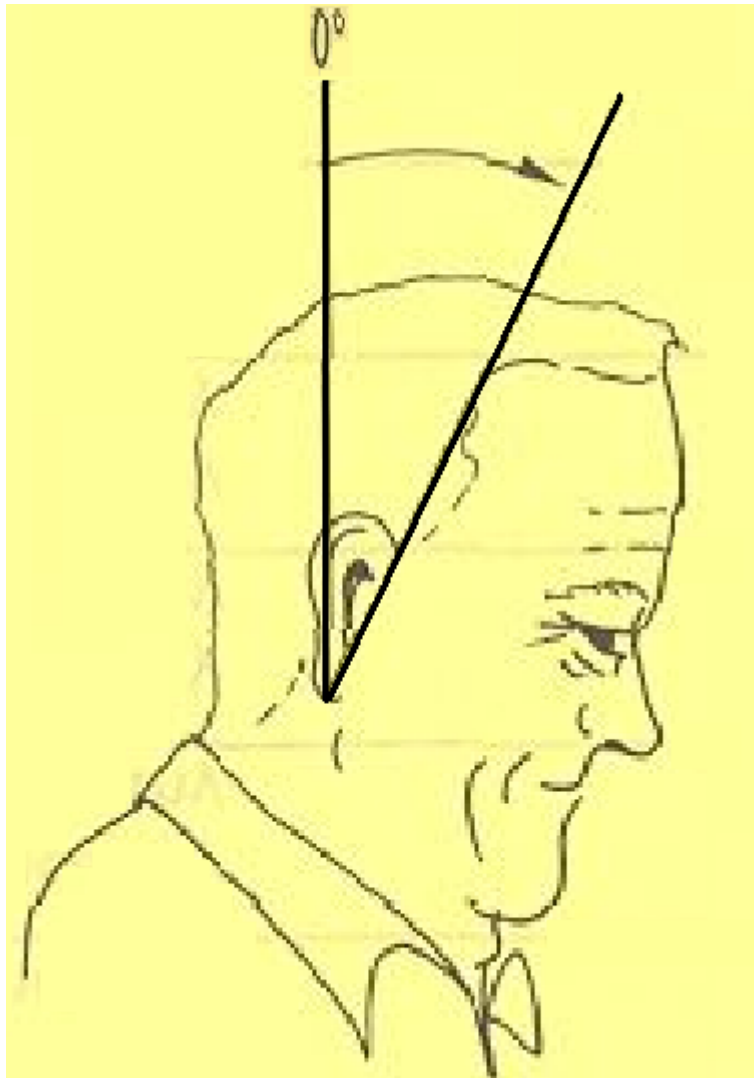


Figure 12: flexion of the head

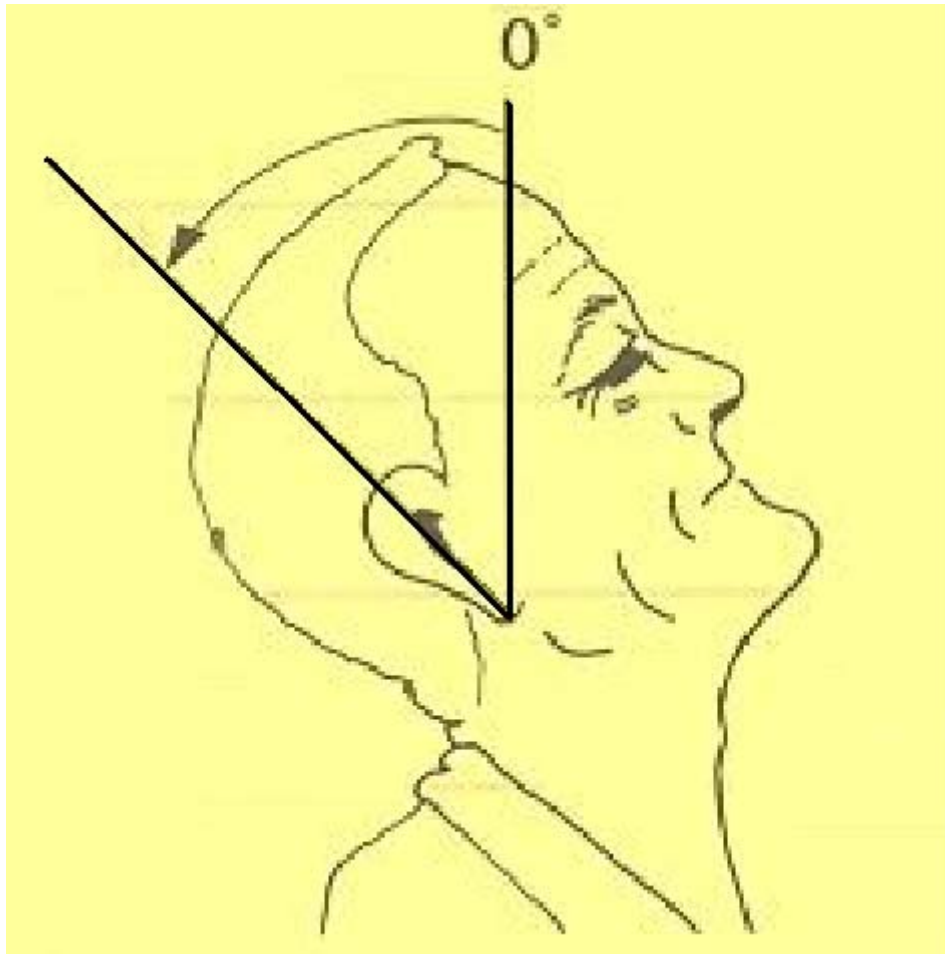


Figure 13: extension of head

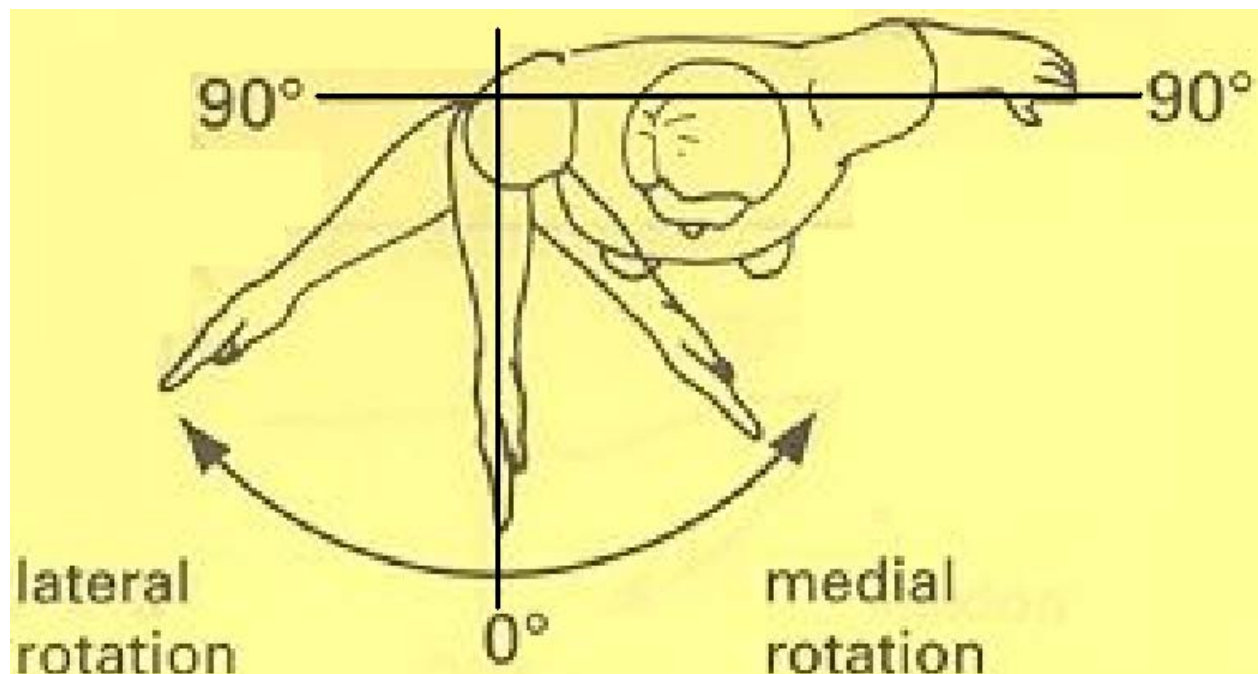


Figure 14: lateral and medial rotation of the shoulder

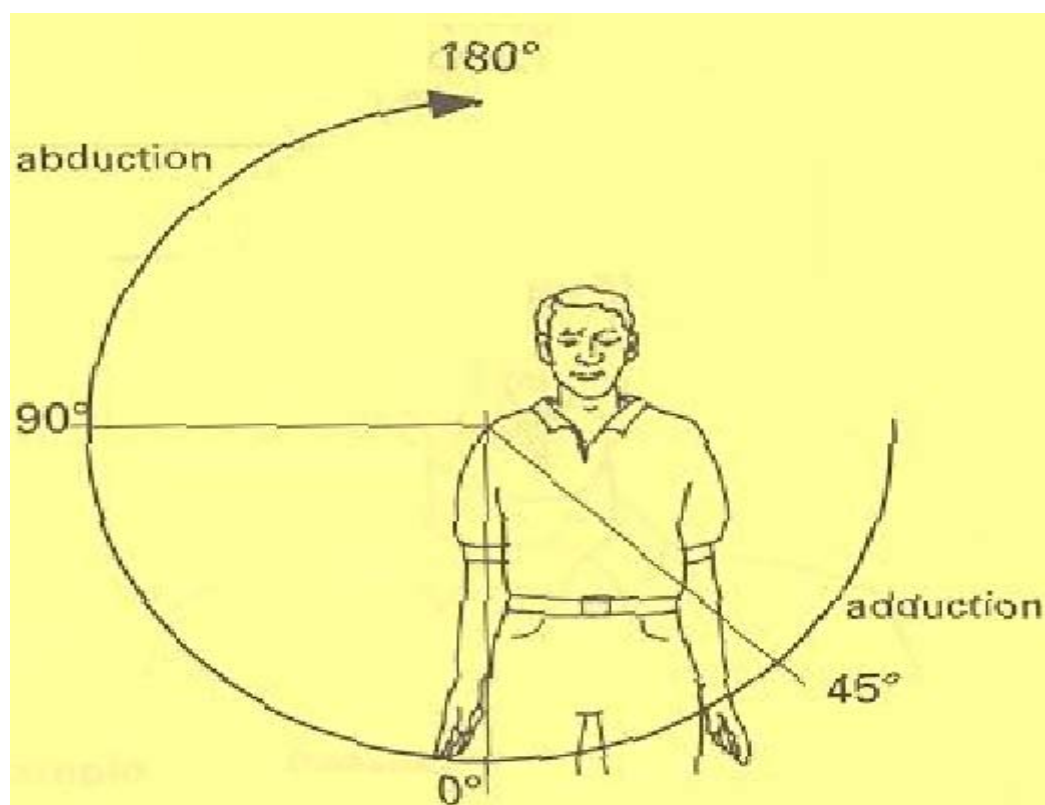


Figure 15: abduction and adduction of the shoulder

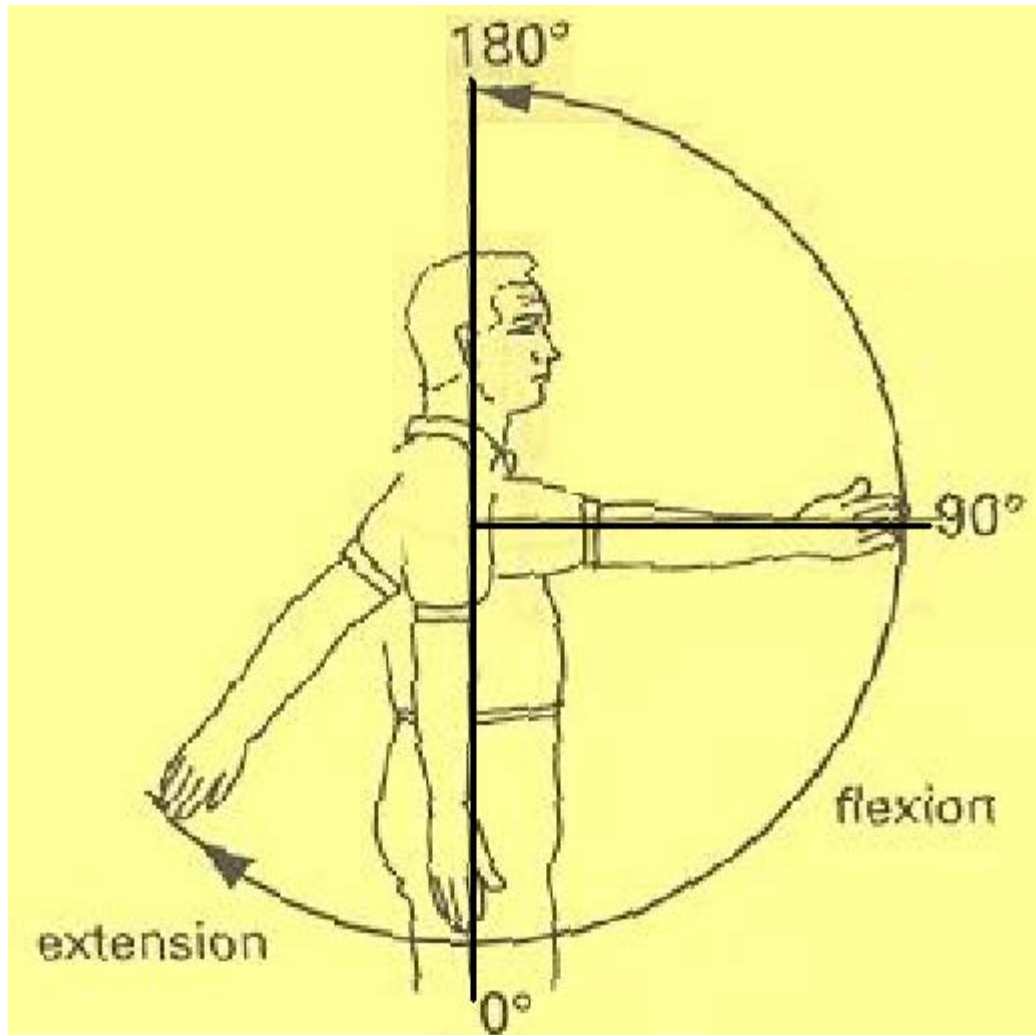


Figure 16: flexion and extension of the shoulder

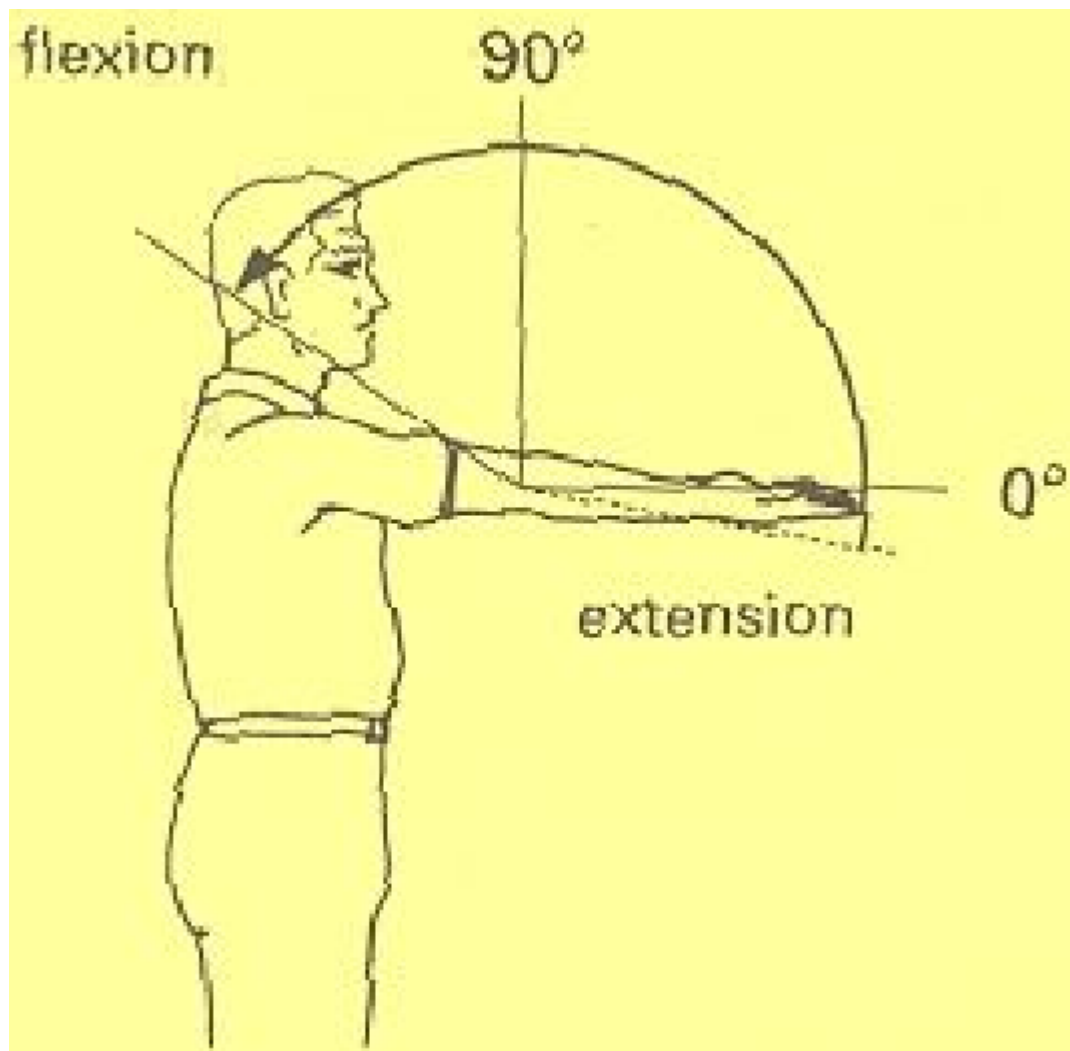


Figure 17: flexion of the elbow

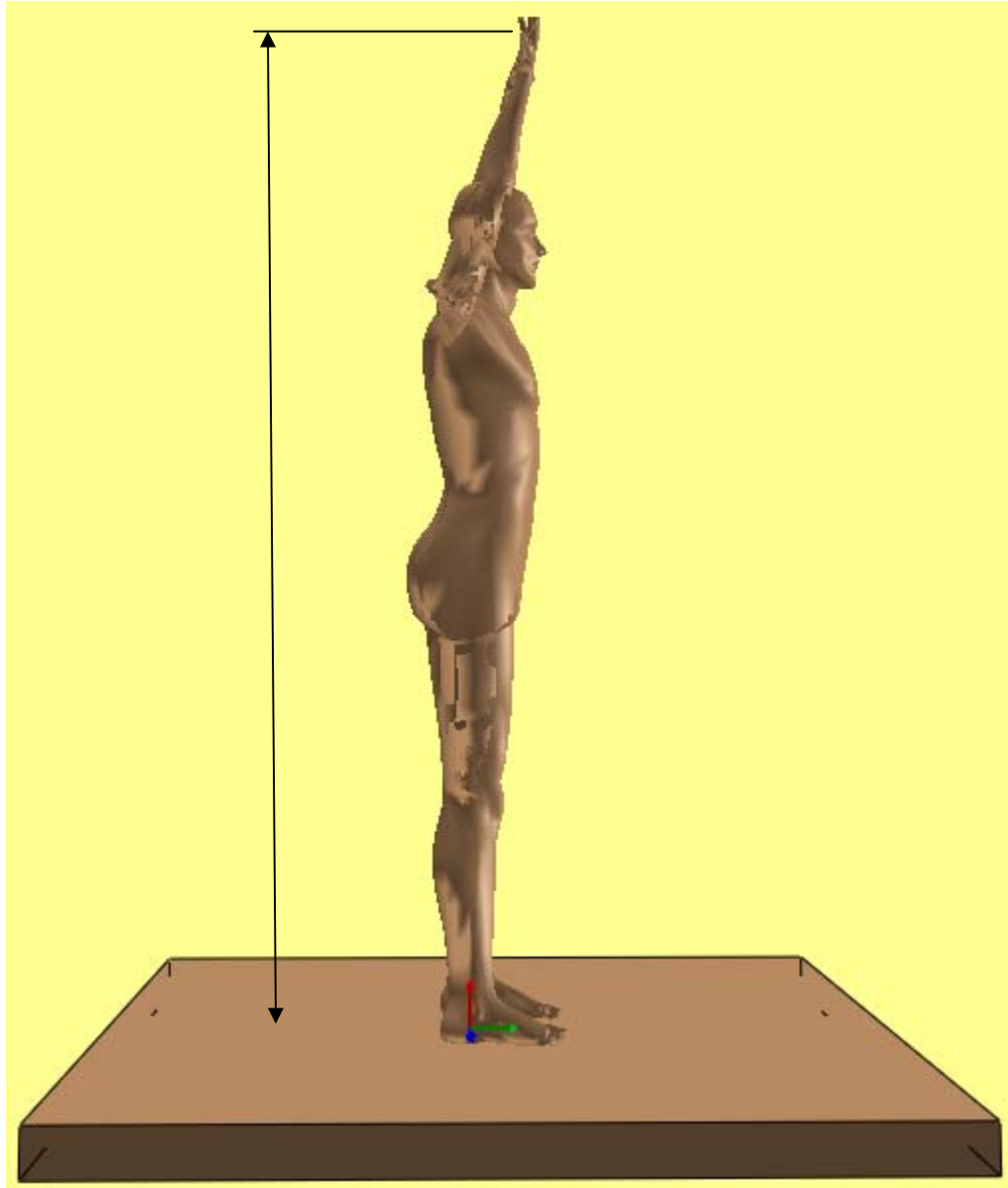


Figure 18: overhead grip reach

Measurement of independent variables did not require any significant exertion on part of the subjects. Even so, to prevent static fatigue when measuring the reaches and range of motion measures, adequate rest breaks were provided after each measurement. The anthropometers were portable and the investigators carried the equipment to data collection sites where the seniors gathered for their daily activity routines.

The self-reported rating of Mexican American older adults in performing specific household tasks requiring significant reaching for task initiation, performance and completion were assessed using the OARS Multidimensional Functional Assessment of Older Adults Questionnaire developed by Duke University (Fillenbaum, 1988). Older adult participants were interviewed by project personnel for completion of the OARS questionnaire. To minimize any bias due to language (Angel et al., 2000) and maximizing responses (Clausen, 1947), both English and Spanish versions of the questionnaire were prepared and used. After a brief introduction to the items in the questionnaire, participants were instructed to complete the questionnaire. To minimize instruction error, each participant was instructed in English/Spanish on the meaning of each question and task included in the survey. Individual subjects were provided further clarification, if needed, during the survey process. Studies show that despite careful questionnaire development and use for self-reports, it is likely that older adult subjects who are seriously impaired in functioning, will tend to overestimate their self-reported ability to perform tasks (Angel et al., 2000).

4.3 Experimental Design

Design of Experiment:

I will compare the older Mexican Americans' anthropometric data to the Anglo American data through a multivariate analysis of variance and means (MANOVA) utilizing the SPSS software. MANOVA is an advanced version of ANOVA with multiple dependent variables. Rather than outputting a univariate F value, MANOVA produces a multivariate output. Specifically, MANOVA performs analysis for Wilks', Lawley-Hotelling, Pillai's, and Roy's F values. Wilks' Lambda is the pooled ratio of error variances to effect variance plus error variance. Hotelling's trace is the pooled ratio of effect variance to error variance and Pillai's criterion is the pooled effect variances. MANOVA is optimal to assess if the anthropometric data differs between the Anglo American and Mexican American data because MANOVA aims to compare the means and variance of variables across groups.

MANOVA Setup:

Independent Variables:

Age – continuous

Gender – two levels (Male, Female)

Ethnicity – two levels (Anglo Americans, Mexican Americans)

Dependent Variables:

1. H - Height
2. O.F.R. - overhead fingertip reach
3. O.G.R. overhead grip reach
4. Arm Span - arm span

5. U.H.H. - upper hand height
6. L.H.H. - lower hand height
7. V.R.D. - vertical reach distance
8. H.D.F.B.H. - horizontal distance from buttock to hand
9. F.F.R - forward fingertip reach
10. F.G.R - forward grip reach
11. R.H.R - rotation of the head to the right
12. R.H.L - rotation of the head to the left
13. F.H - flexion of head
14. E.H - extension of head
15. L.R.S - lateral rotation of the shoulder
16. M.R.S. - medial rotation of the shoulder
17. Ab. S. - abduction of the shoulder
18. Ad. S - adduction of the shoulder
19. F.S - flexion of the shoulder
20. E.S - extension of the shoulder
21. F.E - flexion of the elbow

Chapter 5

RESULTS

		Age	Gender	Ethnicity
1	Height	<0.0001	<0.0001	0.001
2	O.F.R.	<0.0001	<0.0001	0.12
3	O.G.R.	<0.0001	<0.0001	0.559
4	Arm Span	0.006	<0.0001	0.196
5	U.H.H.	0.28	0.049	0.731
6	L.H.H.	0.49	0.355	0.094
7	V.R.D.	0.031	0.246	0.061
8	H.D.F.B.H.	0.001	0.001	<0.0001
9	F.F.R	0.023	<0.0001	0.828
10	F.G.R	0.019	<0.0001	0.096
11	R.H.R	<0.0001	0.977	0.011
12	R.H.L	0.001	0.893	0.037
13	F.H	0.947	0.589	<0.0001
14	E.H	0.294	0.204	<0.0001
15	L.R.S	0.39	0.405	0.019
16	M.R.S.	0.739	0.217	<0.0001
17	Ab. S.	0.075	0.969	<0.0001
18	Ad. S	0.532	0.39	<0.0001
19	F.S	<0.0001	0.364	0.356
20	E.S	0.955	0.063	<0.0001
21	FE	<0.0001	0.089	0.432

.05 alpha level

Legend:

MA: Mexican American

AA: Anglo American

Measurements: lb, cm, and degrees

Descriptive Statistics

	Gender	Ethnicity	Mean	Std. Deviation	N
Height	F	AA	156.32	8.173	67
		MA	153.75	6.580	123
		Total	154.66	7.266	190
	M	AA	170.52	9.693	52
		MA	166.98	6.453	125
		Total	168.02	7.693	177
	Total	AA	162.53	11.312	119
		MA	160.42	9.285	248
		Total	161.10	10.020	367
O.F.R.	F	AA	190.89	13.772	67
		MA	190.73	10.256	123
		Total	190.79	11.582	190
	M	AA	207.91	12.285	52
		MA	205.31	12.468	125
		Total	206.07	12.437	177

	Total	AA	198.33	15.597	119
		MA	198.08	13.539	248
		Total	198.16	14.218	367
O.G.R.	F	AA	179.56	13.797	67
		MA	180.33	10.390	123
		Total	180.06	11.675	190
	M	AA	195.55	12.279	52
		MA	195.01	12.028	125
		Total	195.17	12.070	177
	Total	AA	186.55	15.334	119
		MA	187.73	13.419	248
		Total	187.35	14.059	367
Arm Span	F	AA	156.127	10.8433	67
		MA	153.919	10.7452	123
		Total	154.697	10.8031	190
	M	AA	169.315	10.3789	52
		MA	167.134	13.5965	125
		Total	167.775	12.7458	177
	Total	AA	161.890	12.4690	119
		MA	160.579	13.9165	248
		Total	161.004	13.4612	367

U.H.H.	F	AA	182.90	147.927	67
		MA	162.34	9.914	123
		Total	169.59	88.329	190
	M	AA	181.12	12.195	52
		MA	178.17	9.818	125
		Total	179.03	10.622	177
	Total	AA	182.12	110.925	119
		MA	170.32	12.643	248
		Total	174.14	64.074	367
L.H.H.	F	AA	91.701	5.5996	67
		MA	95.096	6.8351	123
		Total	93.899	6.6144	190
	M	AA	112.533	117.9142	52
		MA	100.332	12.4105	125
		Total	103.916	64.5640	177
	Total	AA	100.804	78.3228	119
		MA	97.735	10.3576	248
		Total	98.730	45.3017	367
V.R.D.	F	AA	37.970	23.5495	67
		MA	34.074	14.9708	123
		Total	35.448	18.4884	190

	M	AA	43.225	19.2202	52
		MA	36.957	19.7467	125
		Total	38.798	19.7476	177
	Total	AA	40.266	21.8335	119
		MA	35.527	17.5654	248
		Total	37.064	19.1533	367
H.D.F.B.H.	F	AA	72.393	16.1608	67
		MA	79.283	10.7414	123
		Total	76.853	13.2882	190
	M	AA	76.294	15.7575	52
		MA	84.473	12.1899	125
		Total	82.070	13.8057	177
	Total	AA	74.097	16.0366	119
		MA	81.899	11.7620	248
		Total	79.369	13.7713	367
F.F.R	F	AA	82.140	4.6730	67
		MA	83.687	9.2910	123
		Total	83.142	7.9935	190
	M	AA	88.869	6.9017	52
		MA	88.773	5.3559	125
		Total	88.801	5.8322	177

	Total	AA	85.081	6.6359	119
		MA	86.250	7.9706	248
		Total	85.871	7.5744	367
F.G.R	F	AA	74.230	5.5659	67
		MA	74.301	6.0437	123
		Total	74.276	5.8649	190
	M	AA	81.640	7.8341	52
		MA	79.979	7.0660	125
		Total	80.467	7.3169	177
	Total	AA	77.468	7.5815	119
		MA	77.163	7.1554	248
		Total	77.262	7.2873	367
	F	AA	46.88	8.396	67
		MA	51.77	10.179	123
		Total	50.05	9.848	190
	M	AA	47.12	9.026	52
		MA	51.63	10.774	125
		Total	50.31	10.471	177
R.H.R	Total	AA	46.98	8.641	119
		MA	51.70	10.462	248
		Total	50.17	10.140	367

R.H.L	F	AA	48.27	8.687	67
		MA	52.89	10.456	123
		Total	51.26	10.091	190
	M	AA	48.46	10.952	52
		MA	52.62	12.839	125
		Total	51.40	12.430	177
	Total	AA	48.35	9.698	119
		MA	52.76	11.695	248
		Total	51.33	11.265	367
F.H	F	AA	19.06	6.298	67
		MA	40.75	7.970	123
		Total	33.10	12.759	190
	M	AA	19.12	7.775	52
		MA	41.29	8.413	125
		Total	34.77	13.037	177
	Total	AA	19.08	6.951	119
		MA	41.02	8.184	248
		Total	33.91	12.903	367
E.H	F	AA	26.09	8.131	67
		MA	55.07	8.526	123
		Total	44.85	16.207	190

	M	AA	26.23	6.516	52
		MA	53.62	10.103	125
		Total	45.58	15.517	177
	Total	AA	26.15	7.439	119
		MA	54.34	9.363	248
		Total	45.20	15.861	367
L.R.S	F	AA	63.00	12.142	67
		MA	55.98	13.593	123
		Total	58.45	13.493	190
	M	AA	59.56	11.593	52
		MA	54.56	13.711	125
		Total	56.03	13.289	177
	Total	AA	61.50	11.979	119
		MA	55.26	13.643	248
		Total	57.28	13.432	367
M.R.S	F	AA	50.58	14.988	67
		MA	72.11	10.167	123
		Total	64.52	15.861	190
	M	AA	49.42	10.556	52
		MA	70.18	13.172	125
		Total	64.08	15.633	177

	Total	AA	50.08	13.196	119
		MA	71.14	11.794	248
		Total	64.31	15.731	367
Ab. S	F	AA	30.06	7.808	67
		MA	142.50	25.896	123
		Total	102.85	57.926	190
	M	AA	31.87	7.457	52
		MA	142.31	23.512	125
		Total	109.86	54.322	177
	Total	AA	30.85	7.677	119
		MA	142.40	24.673	248
		Total	106.23	56.250	367
Ad. S	F	AA	126.60	25.394	67
		MA	31.84	12.146	123
		Total	65.25	48.796	190
	M	AA	123.46	19.576	52
		MA	30.11	7.954	125
		Total	57.54	44.428	177
	Total	AA	125.23	22.995	119
		MA	30.97	10.265	248
		Total	61.53	46.837	367

F.S	F	AA	137.16	22.660	67
		MA	142.54	19.163	123
		Total	140.64	20.566	190
	M	AA	136.25	16.664	52
		MA	140.07	21.130	125
		Total	138.95	19.952	177
	Total	AA	136.76	20.185	119
		MA	141.29	20.175	248
		Total	139.83	20.262	367
E.S	F	AA	53.16	14.292	67
		MA	61.94	11.908	123
		Total	58.85	13.437	190
	M	AA	56.88	14.430	52
		MA	64.89	10.894	125
		Total	62.54	12.543	177
	Total	AA	54.79	14.411	119
		MA	63.43	11.480	248
		Total	60.63	13.126	367
F.E	F	AA	128.60	15.224	67
		MA	133.42	15.310	123
		Total	131.72	15.414	190

M	AA	127.42	13.380	52
	MA	130.06	15.872	125
	Total	129.29	15.193	177
Total	AA	128.08	14.400	119
	MA	131.73	15.655	248
	Total	130.55	15.335	367

Height

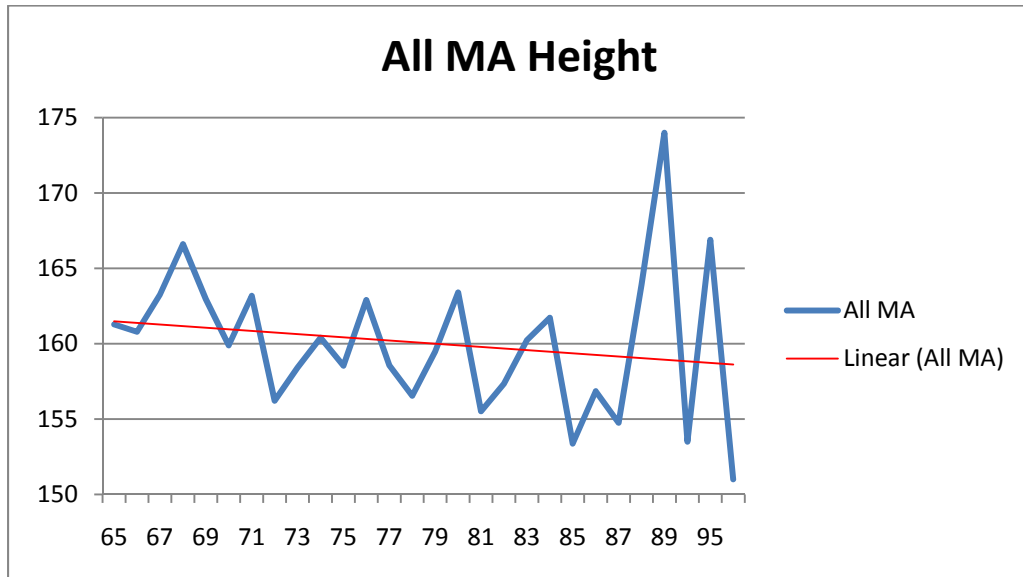


Figure 19: Height

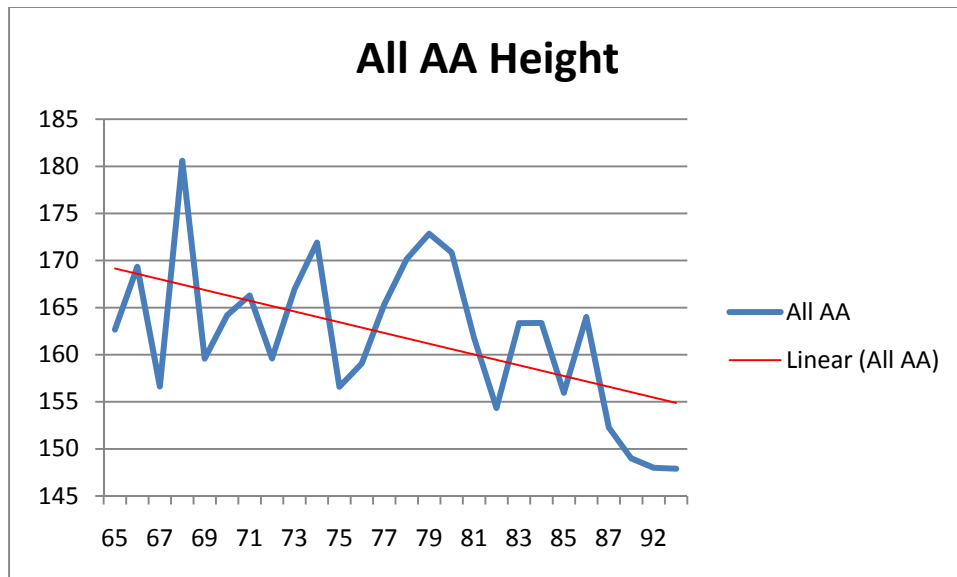


Figure 20: Height

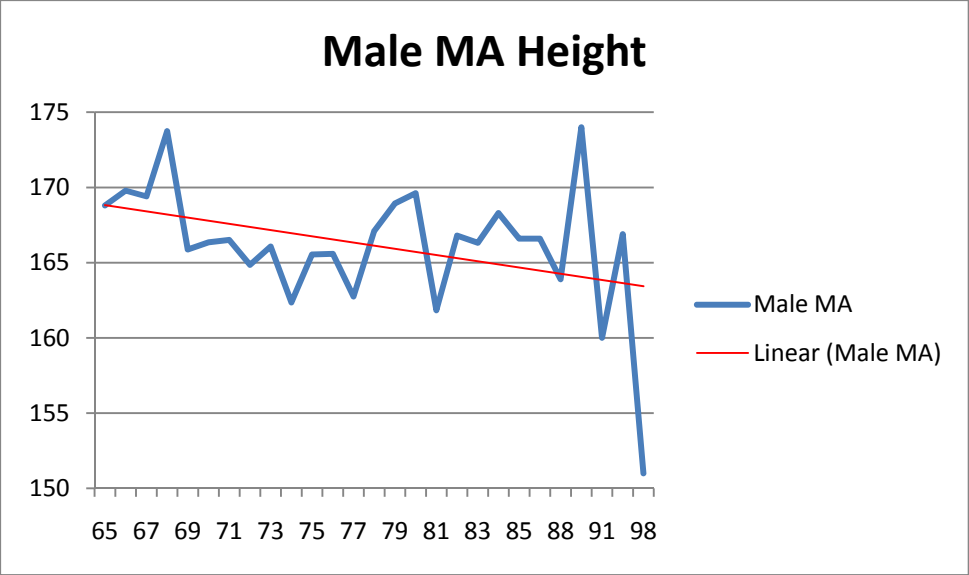


Figure 21: Height

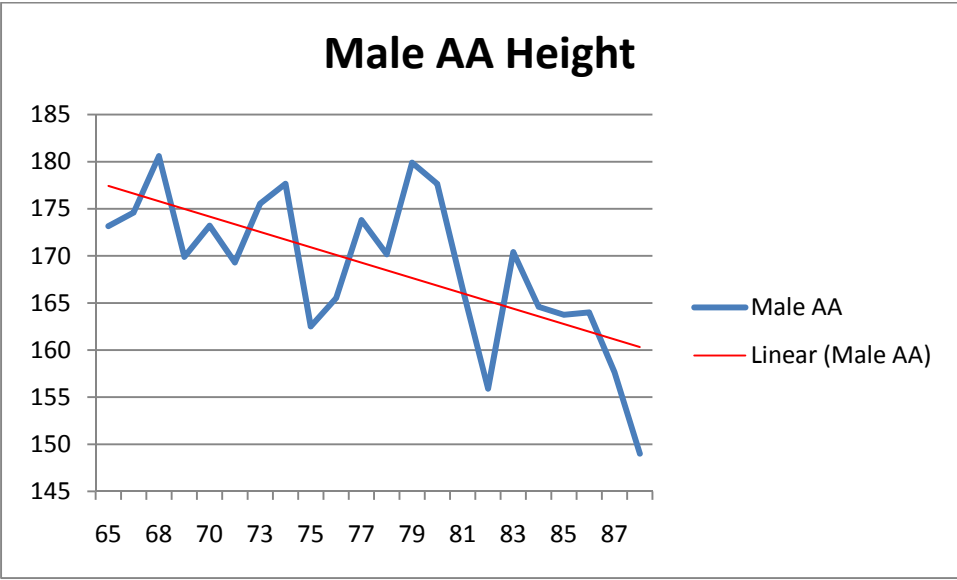


Figure 22: Height

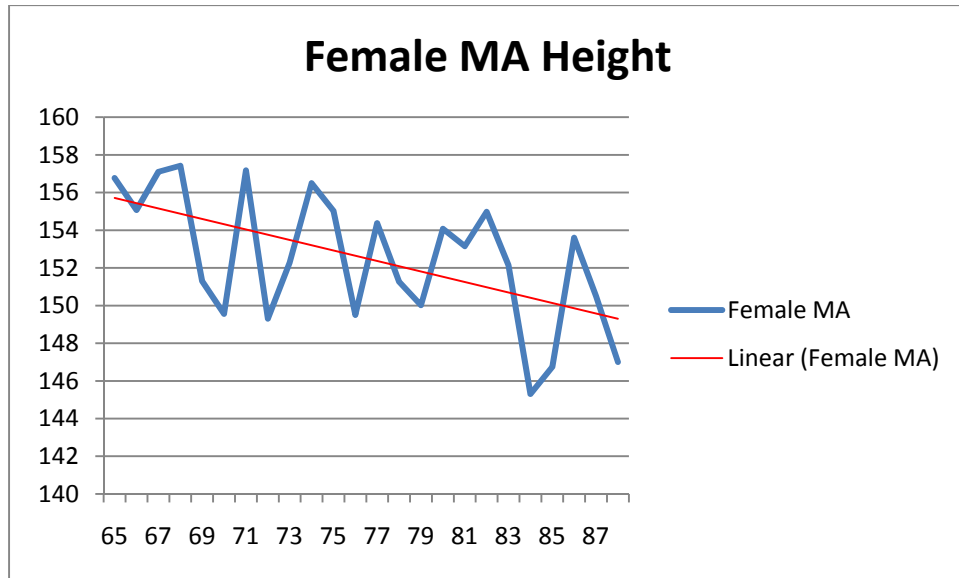


Figure 23: Height

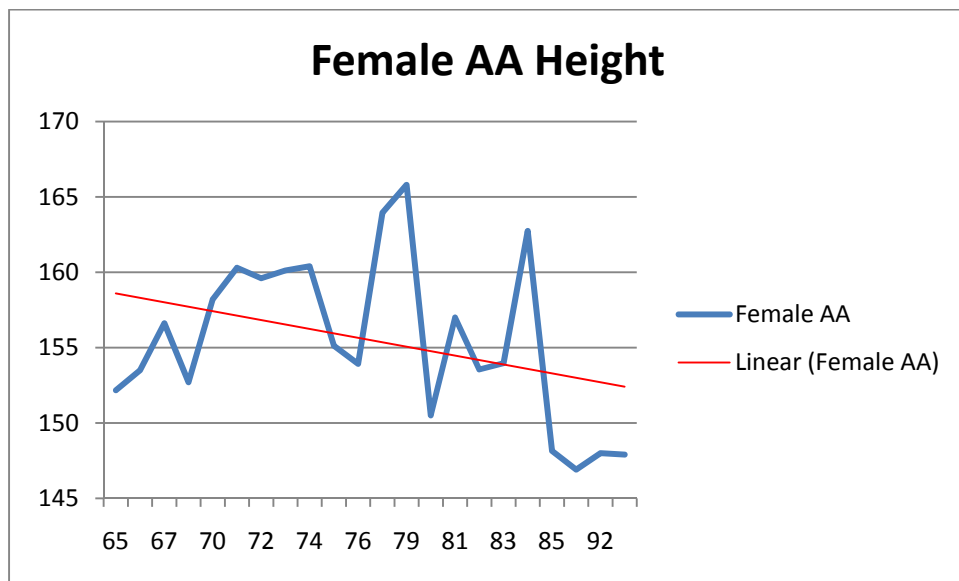


Figure 24: Height

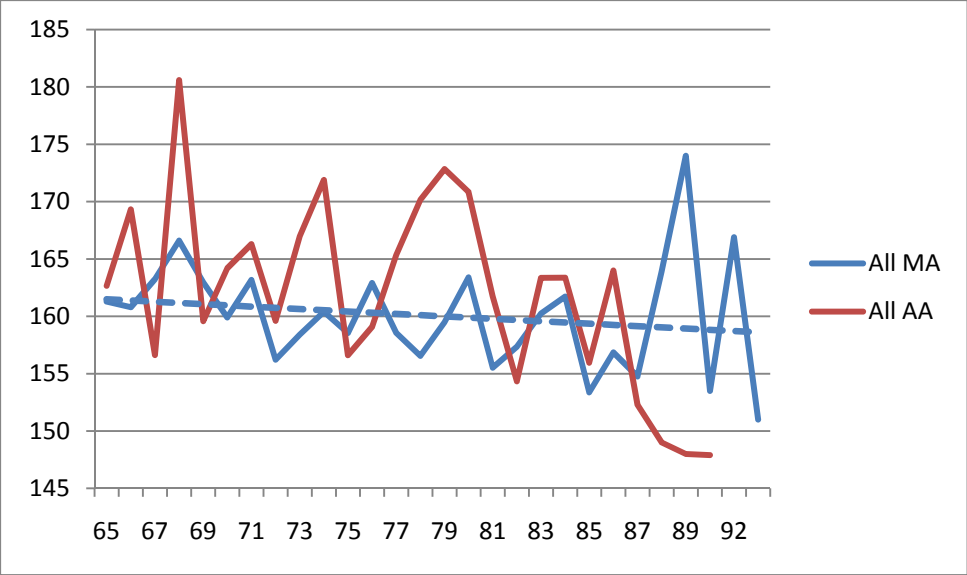


Figure 25: Height

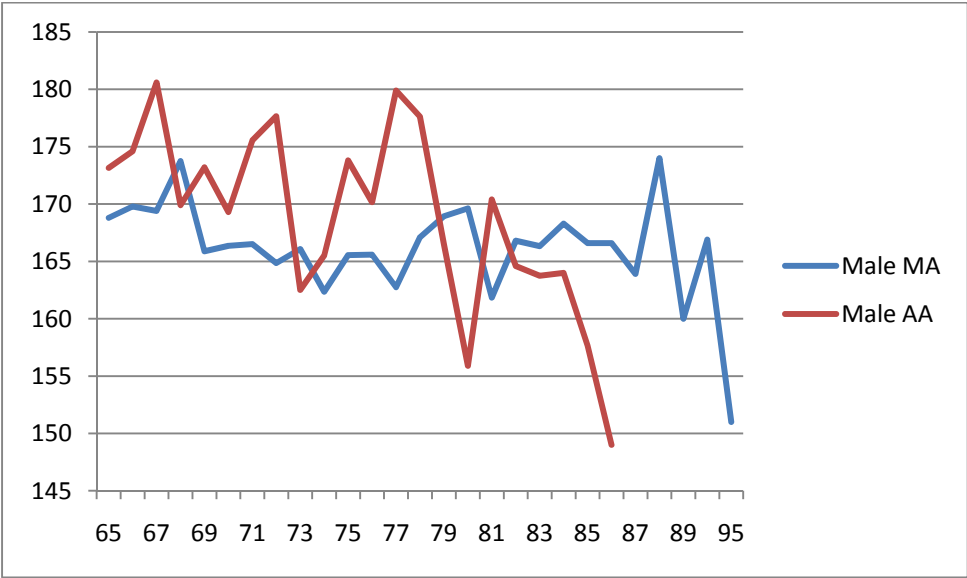


Figure 26: Height

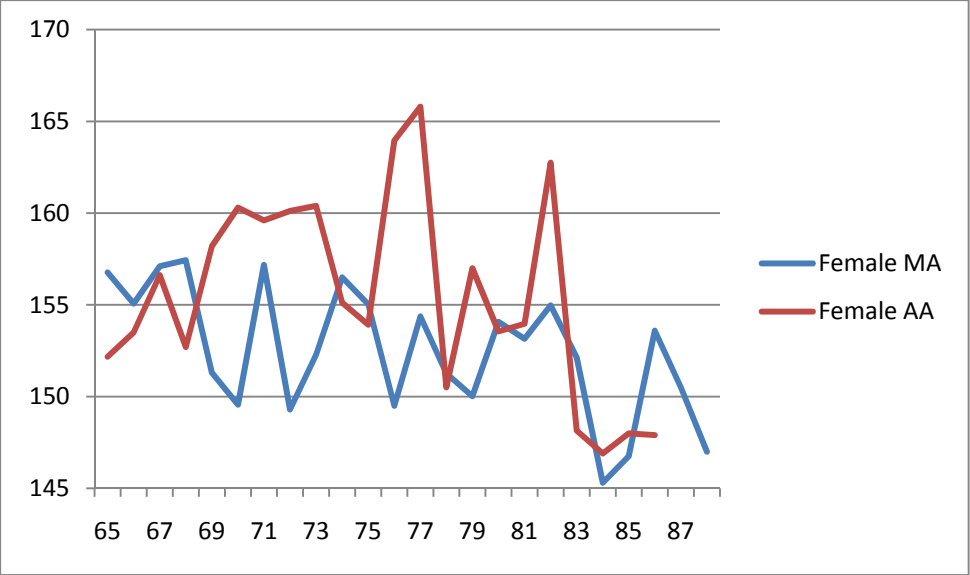


Figure 27: Height

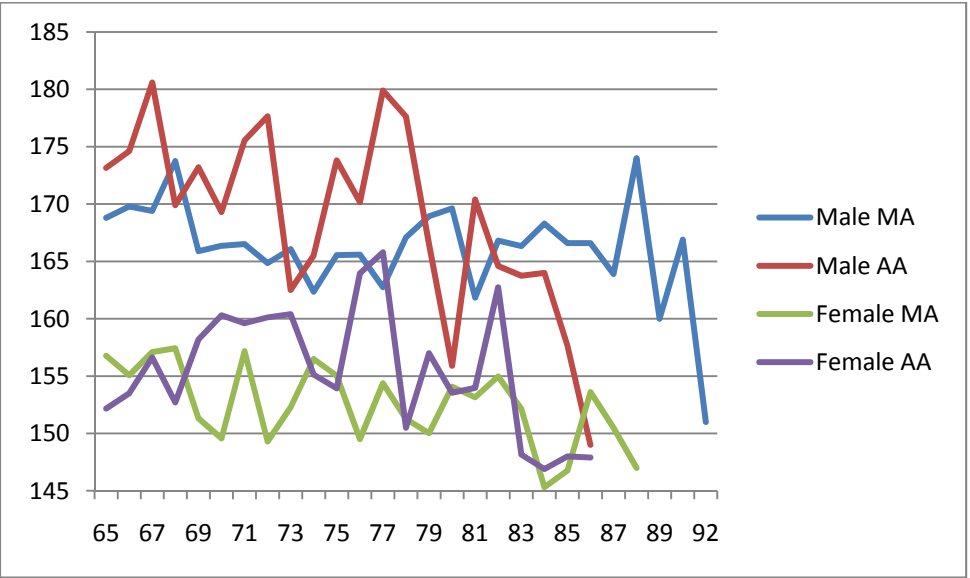


Figure 28: Height

Overhead Fingertip Reach

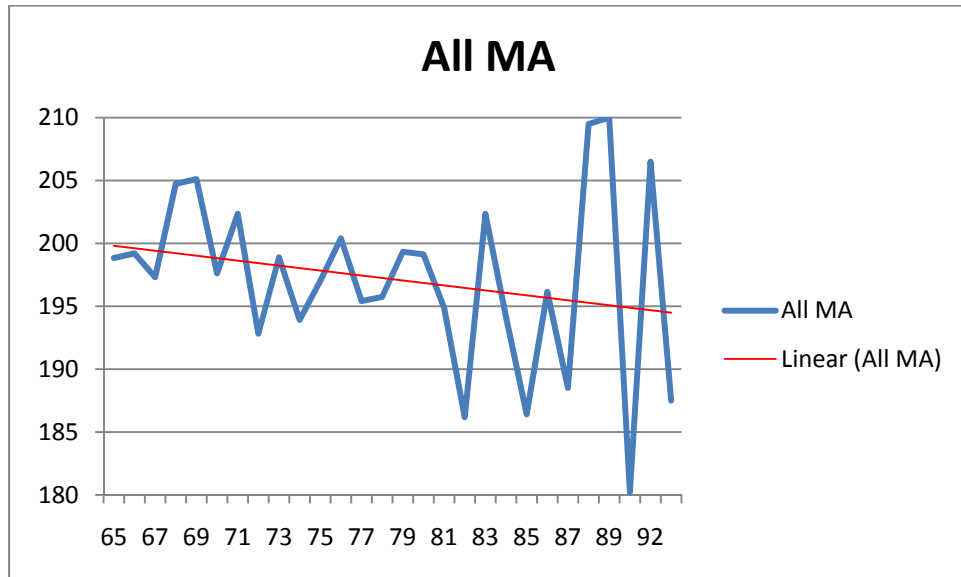


Figure 29: Overhead Fingertip Reach

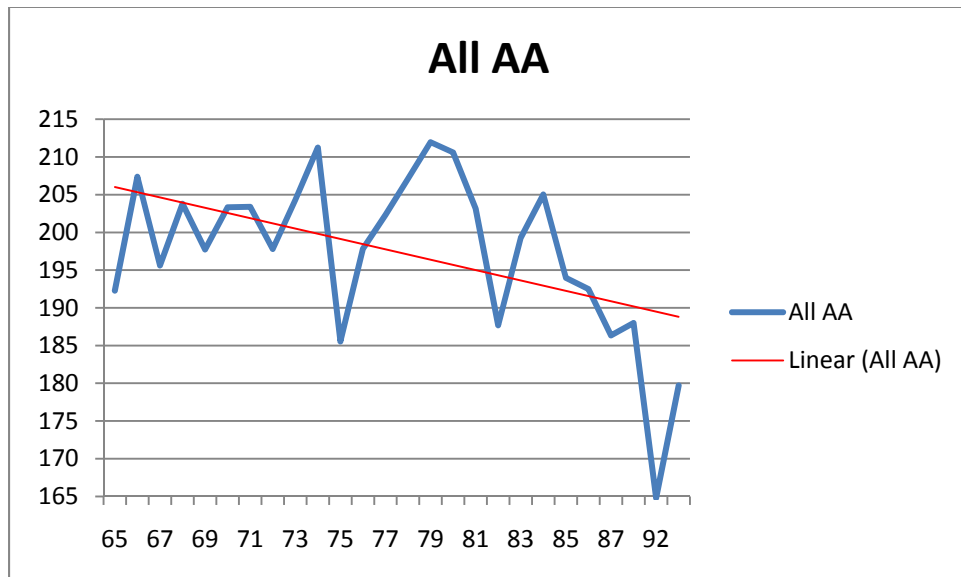


Figure 30: Overhead Fingertip Reach

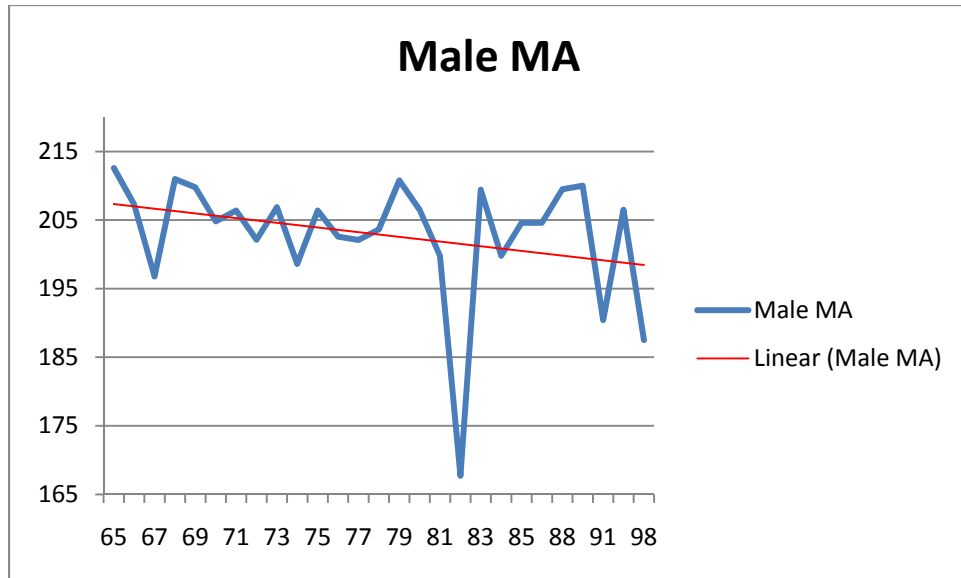


Figure 31: Overhead Fingertip Reach

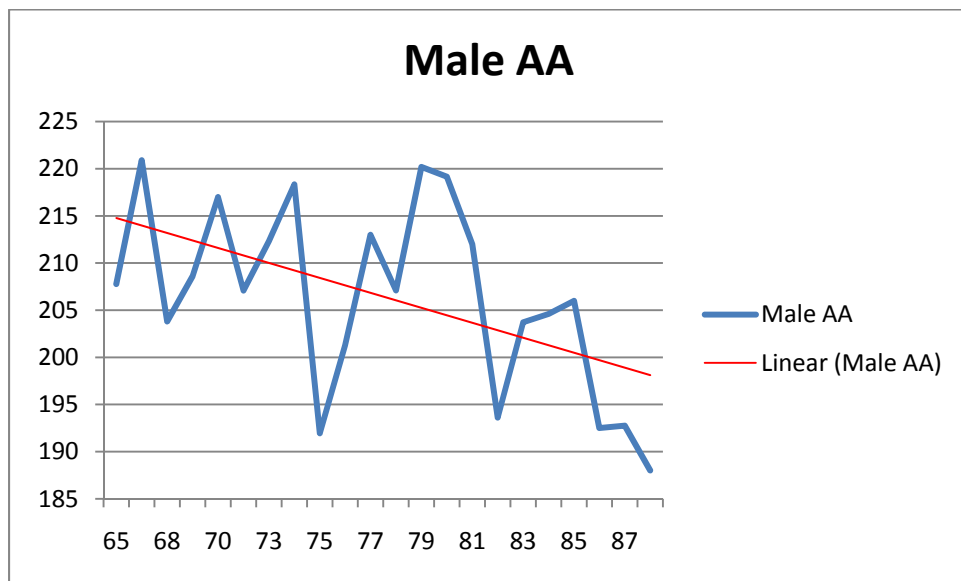


Figure 32: Overhead Fingertip Reach

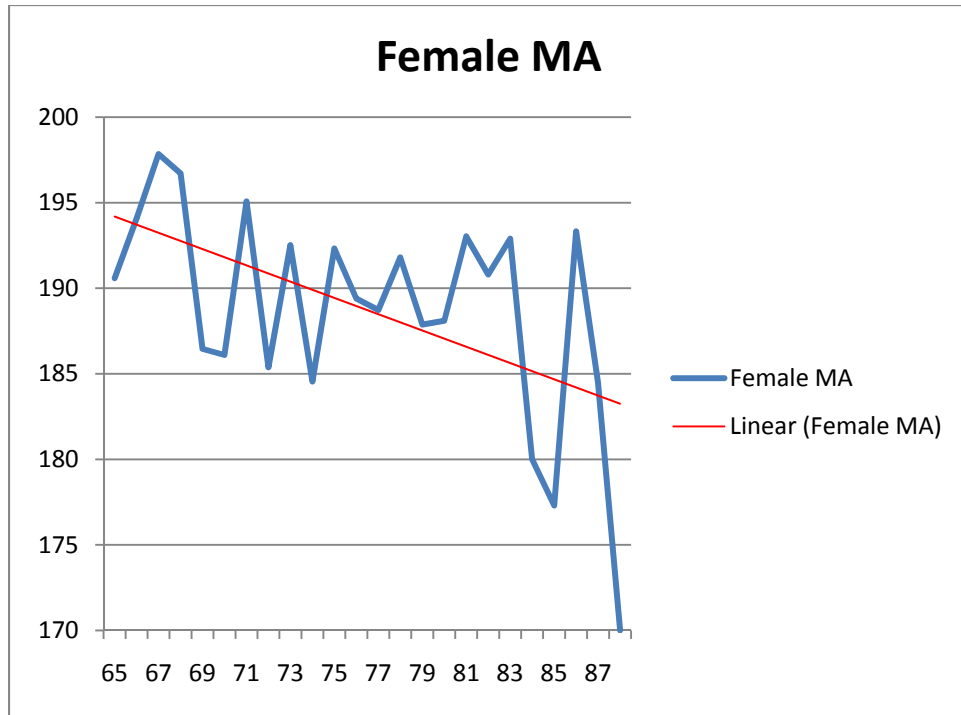


Figure 33: Overhead Fingertip Reach

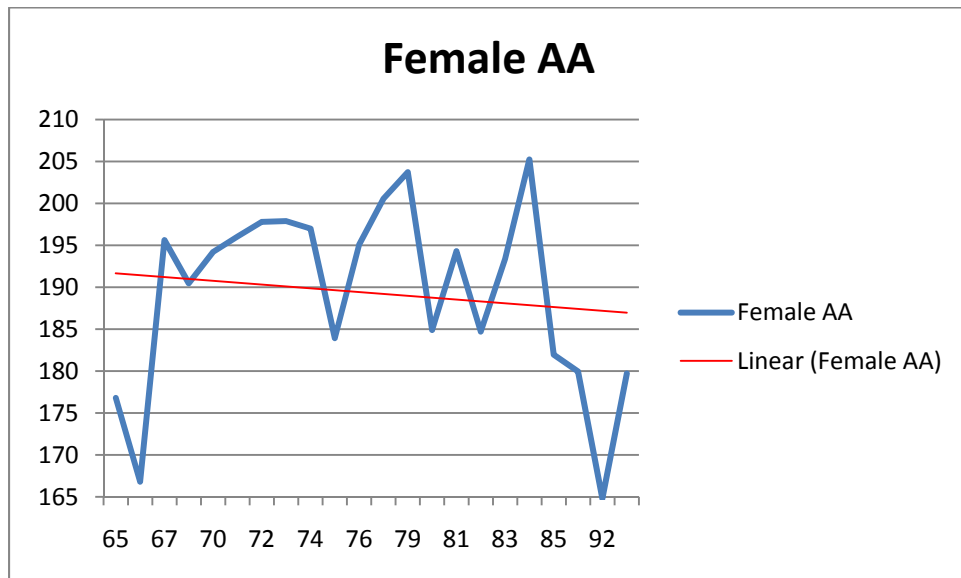


Figure 34: Overhead Fingertip Reach

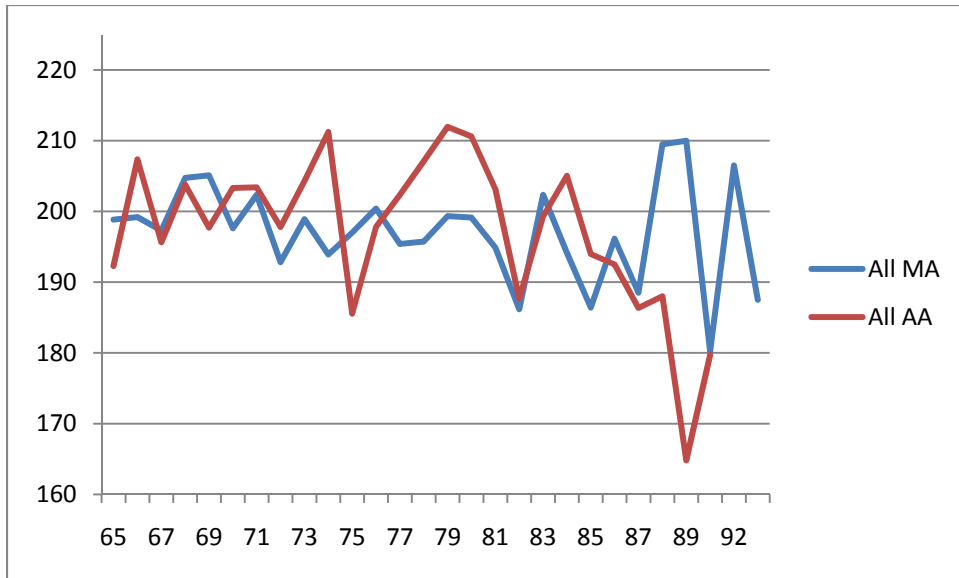


Figure 35: Overhead Fingertip Reach

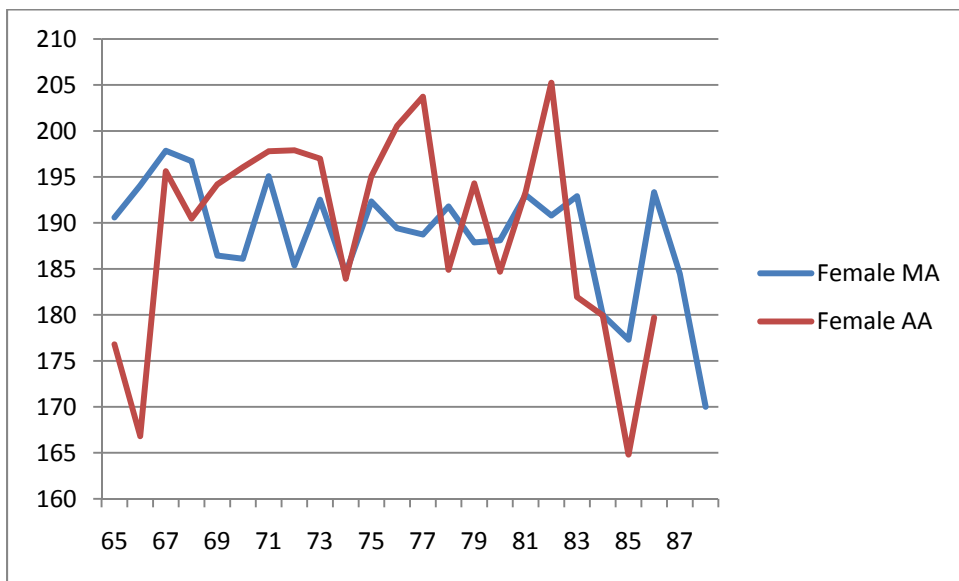


Figure 36: Overhead Fingertip Reach

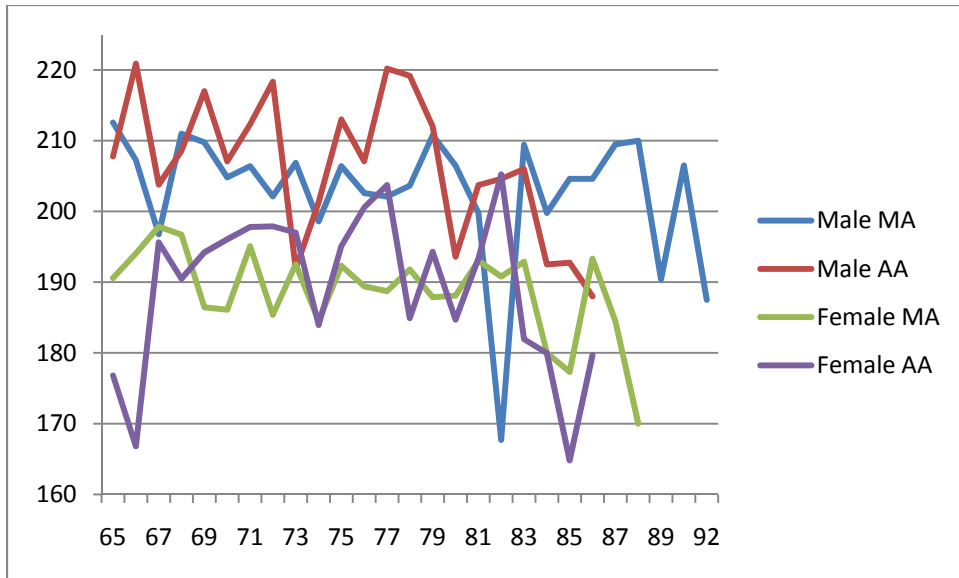


Figure 37: Overhead Fingertip Reach

Overhead Grip Reach

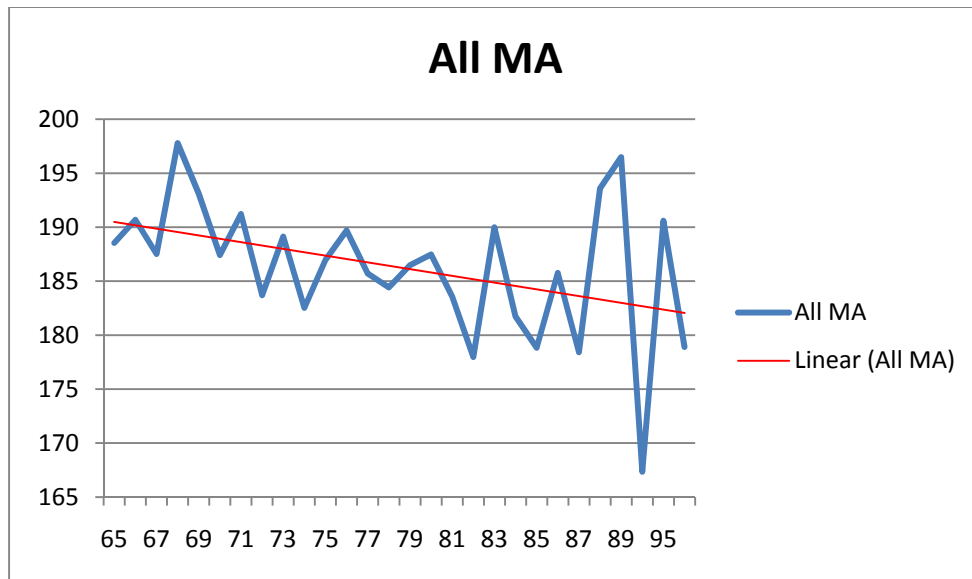


Figure 38: Overhead Grip Reach

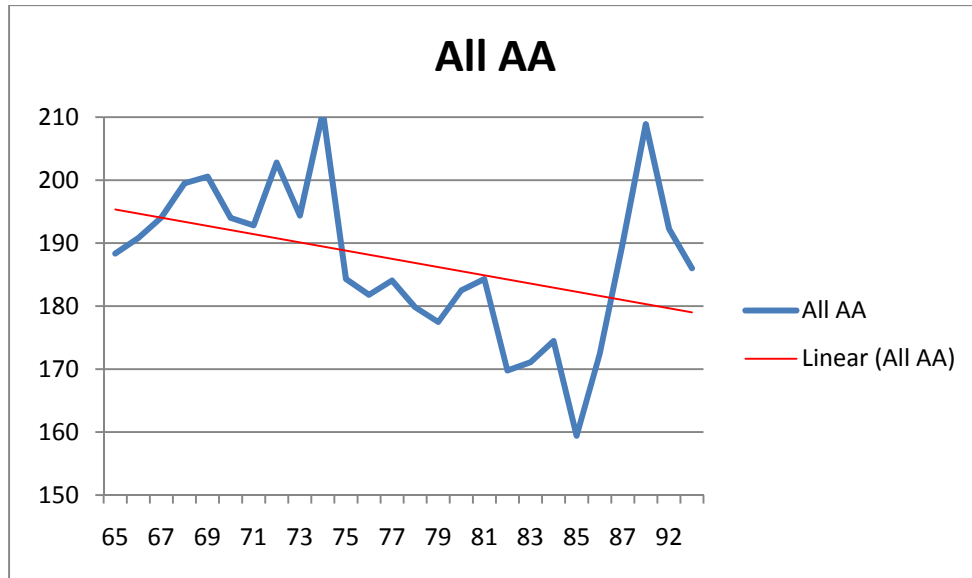


Figure 39: Overhead Grip Reach

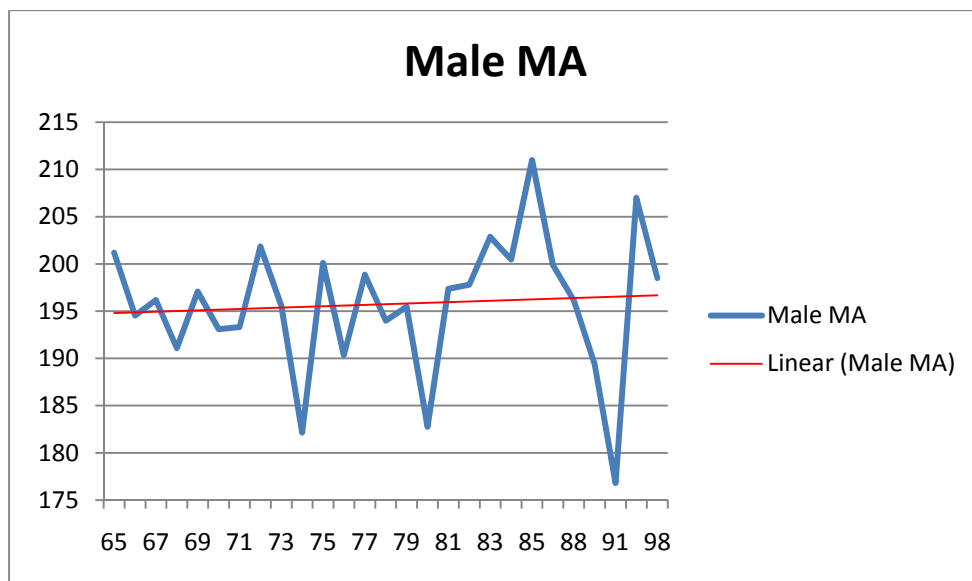


Figure 40: Overhead Grip Reach

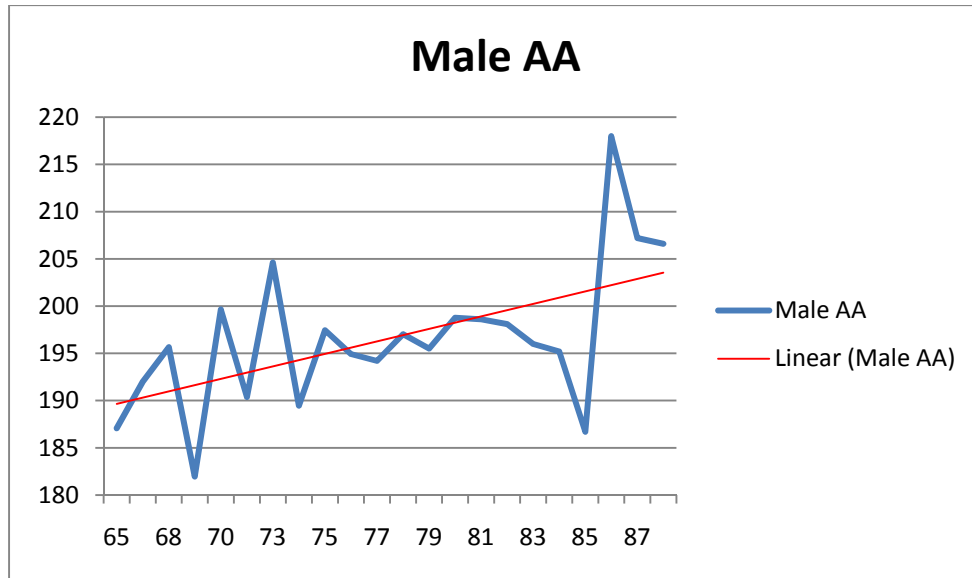


Figure 41: Overhead Grip Reach

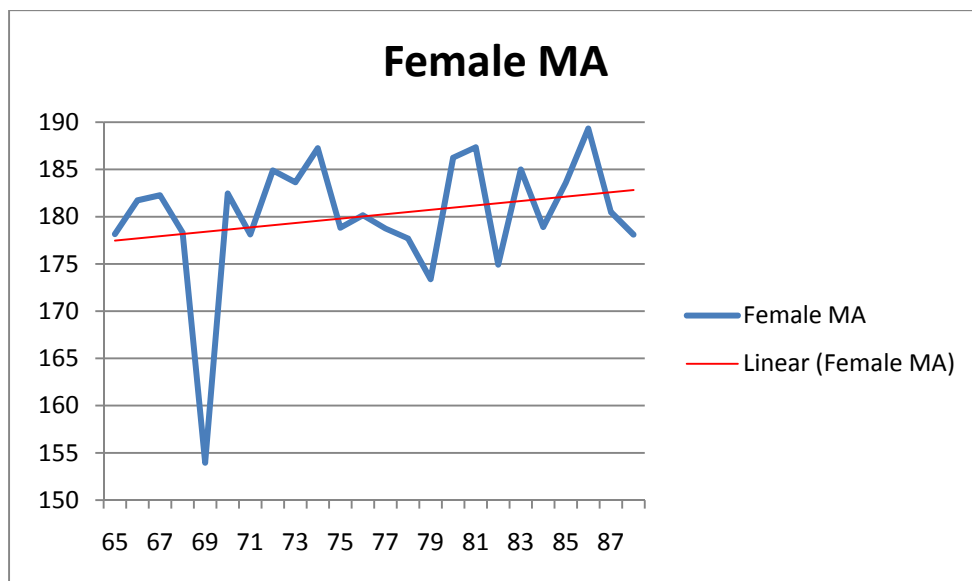


Figure 42: Overhead Grip Reach

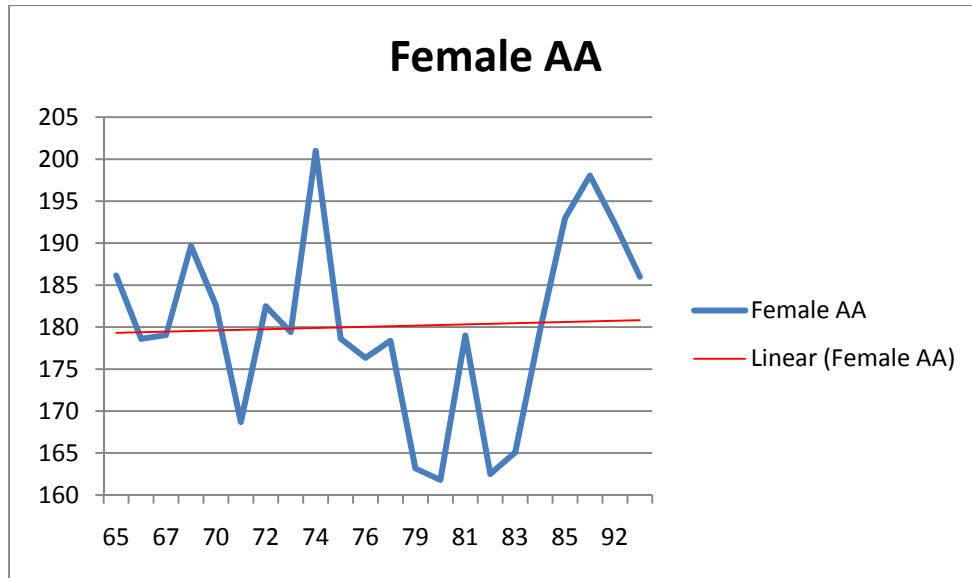


Figure 43: Overhead Grip Reach

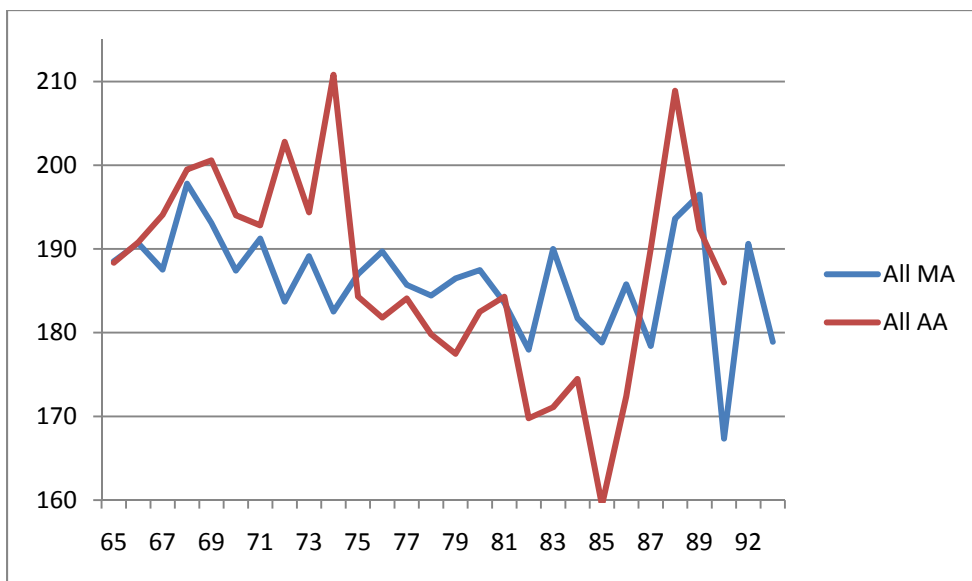


Figure 44: Overhead Grip Reach

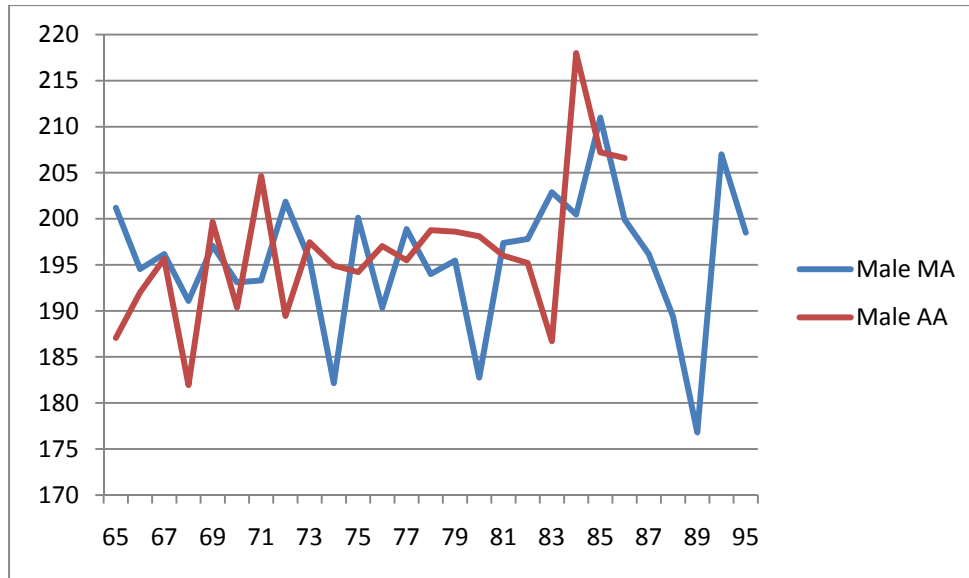


Figure 45: Overhead Grip Reach

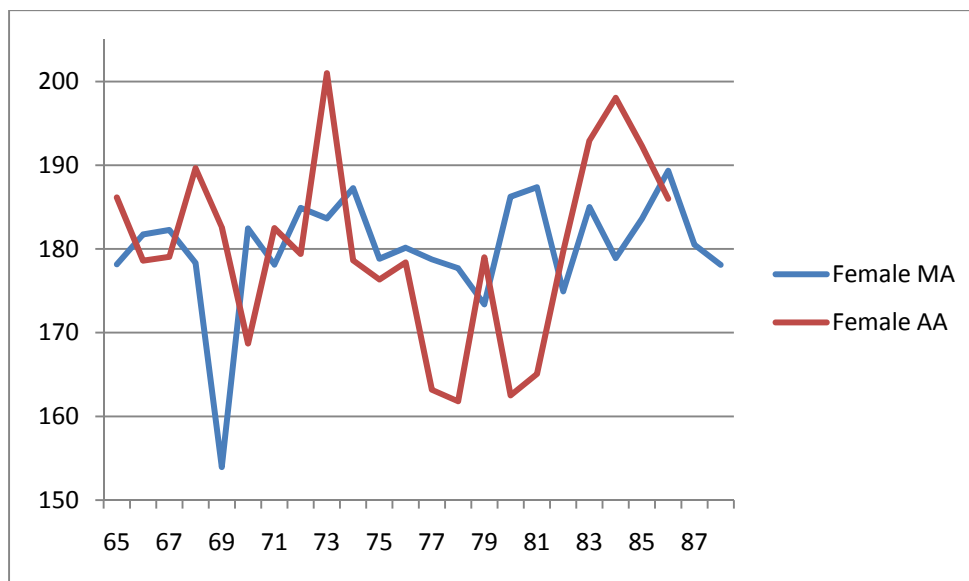


Figure 46: Overhead Grip Reach

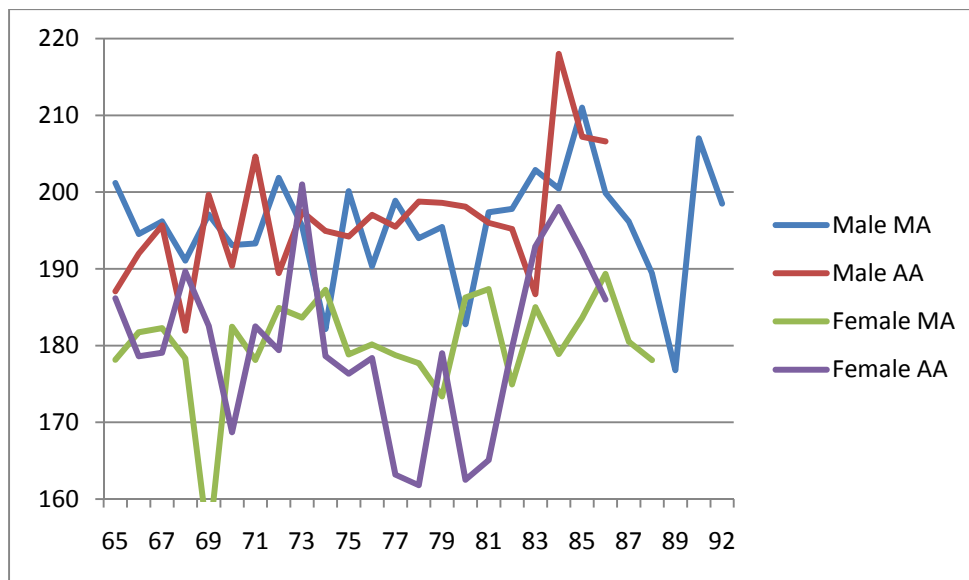


Figure 47: Overhead Grip Reach

Arm Span

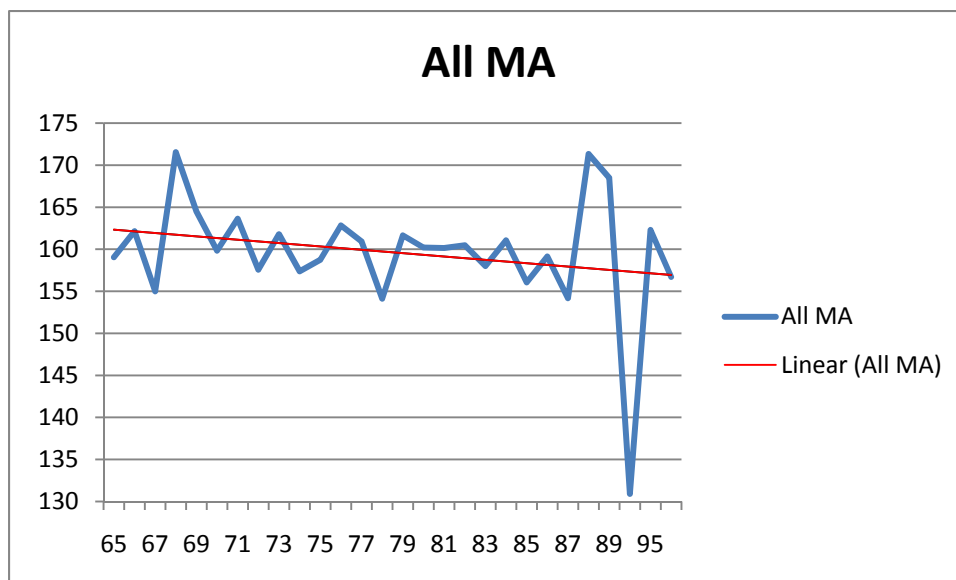


Figure 48: Arm Span

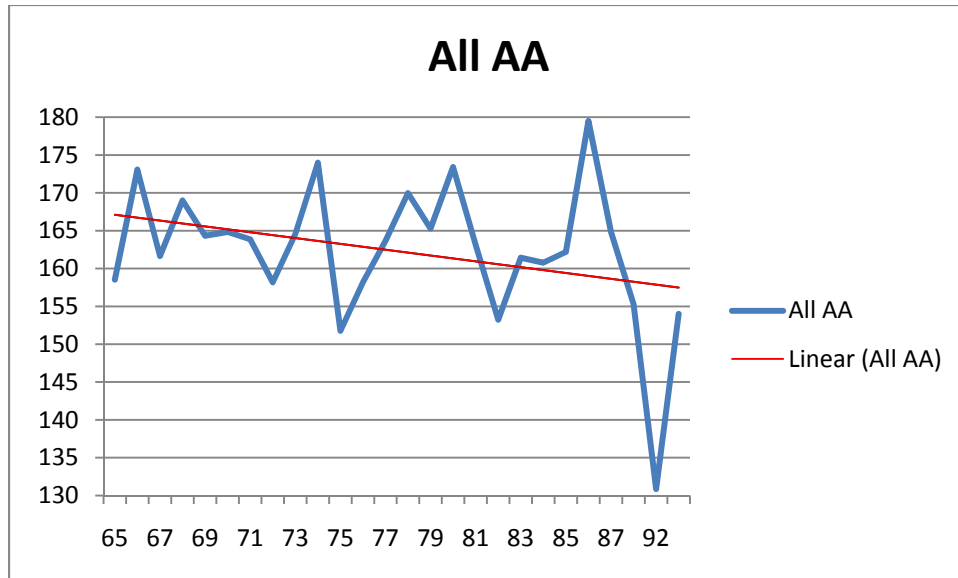


Figure 49: Arm Span

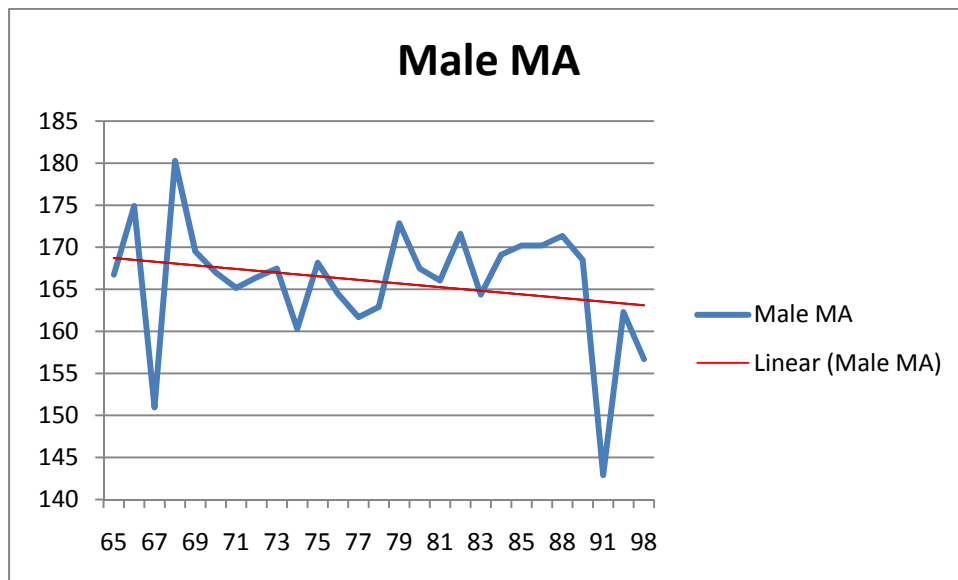


Figure 50: Arm Span

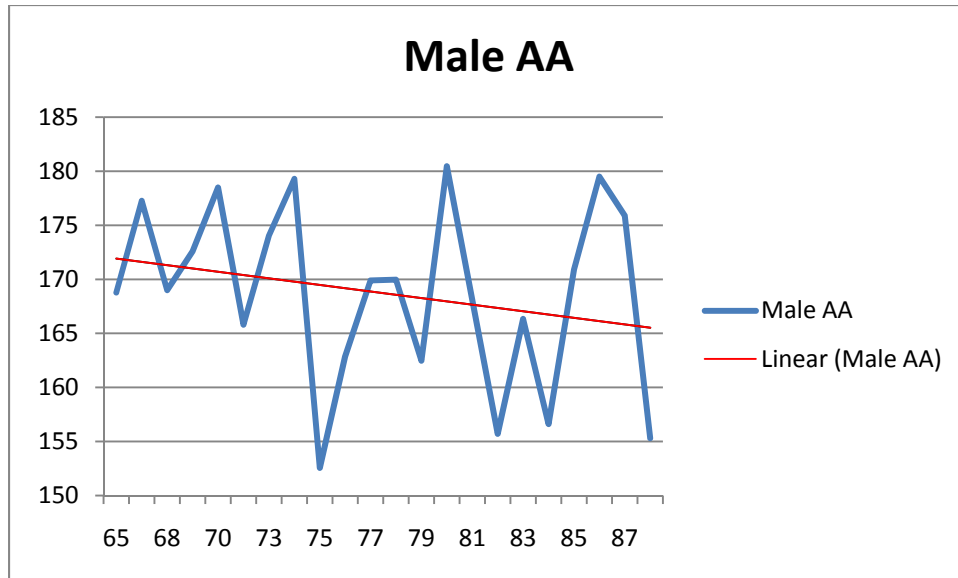


Figure 51: Arm Span

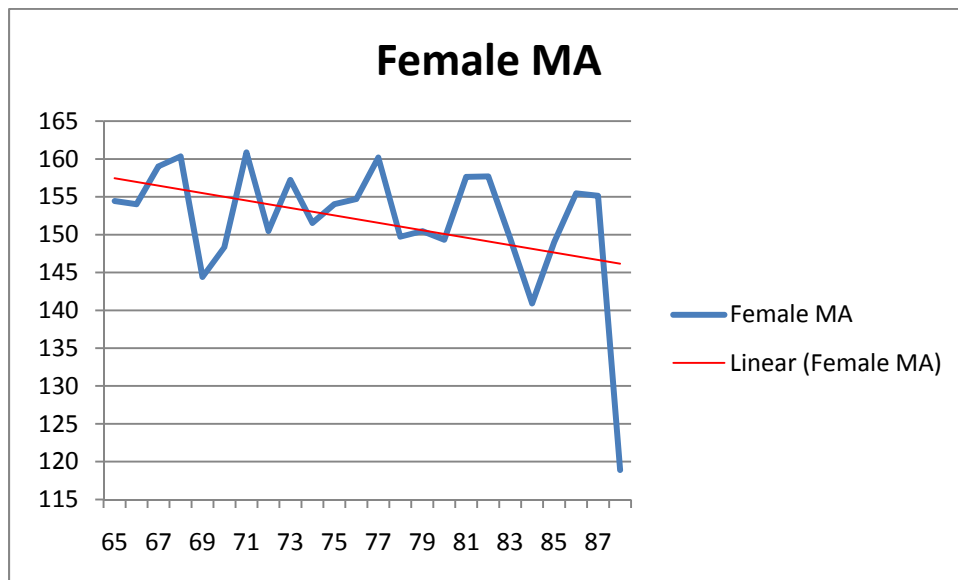


Figure 52: Arm Span

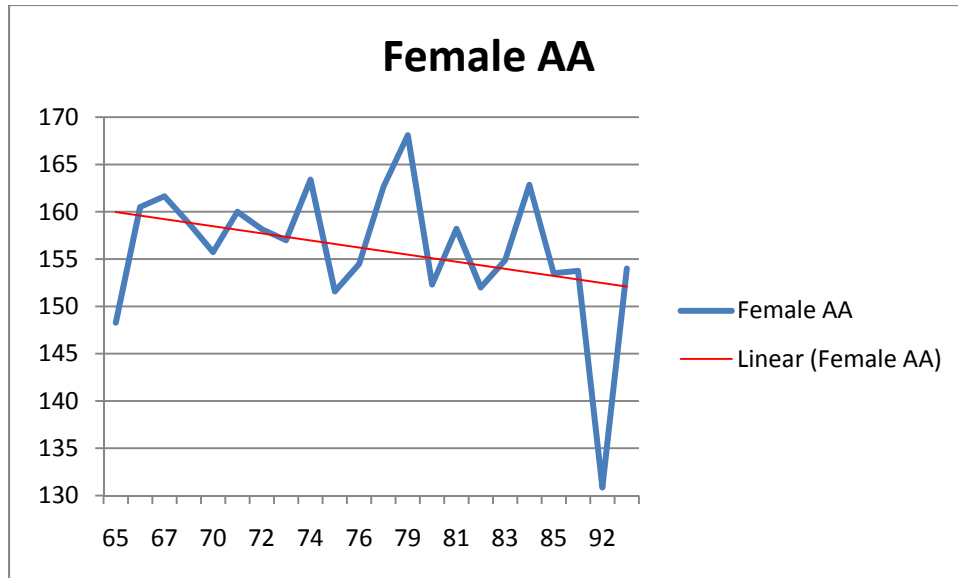


Figure 53: Arm Span

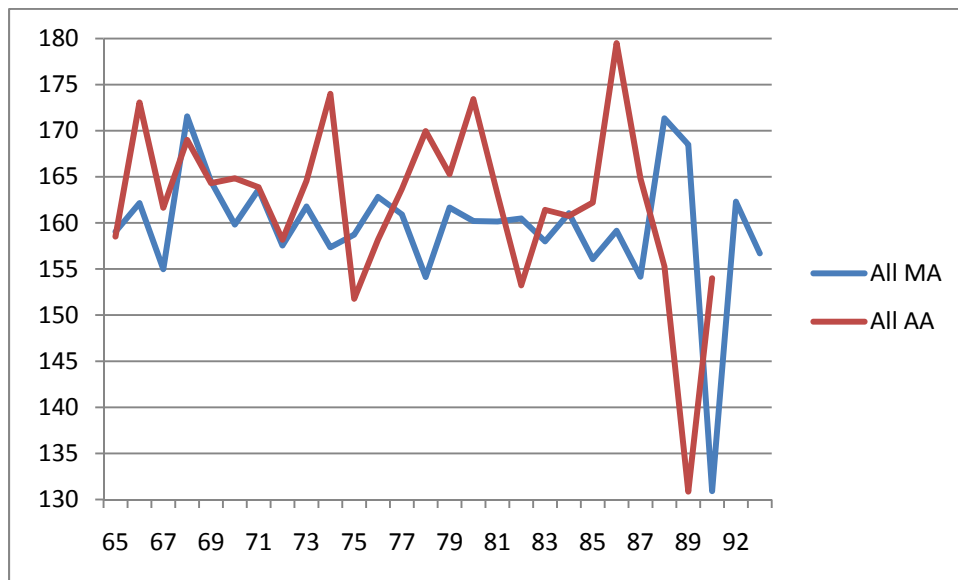


Figure 54: Arm Span

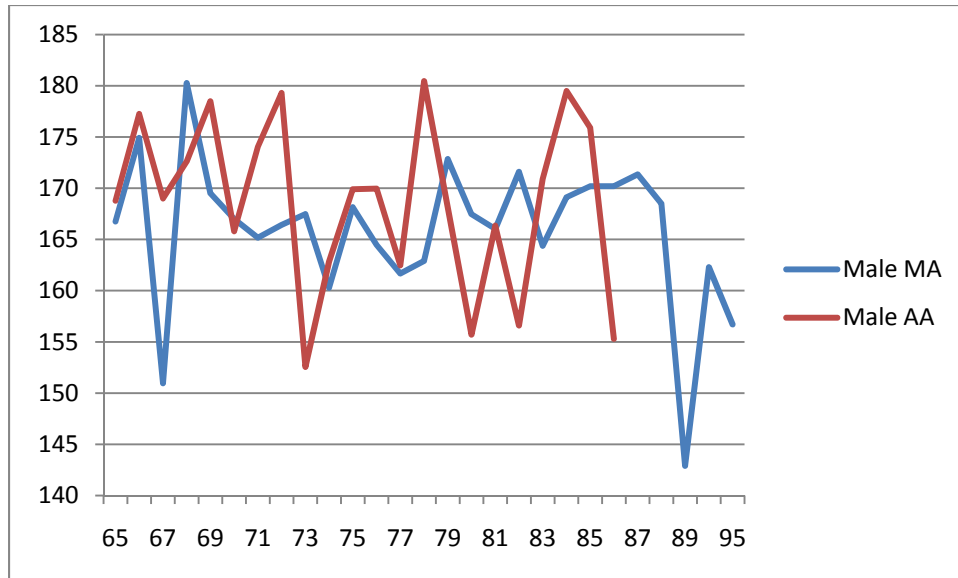


Figure 55: Arm Span

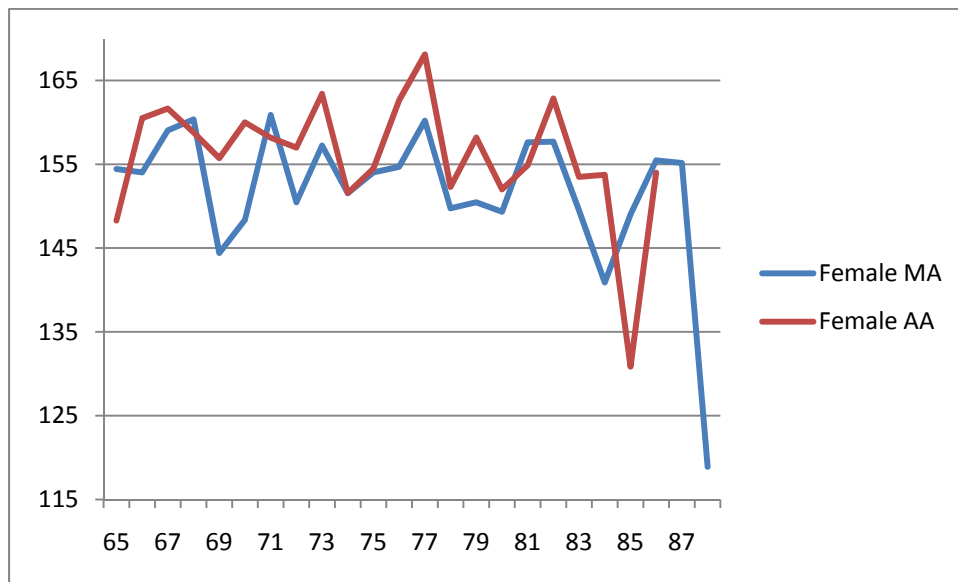


Figure 56: Arm Span

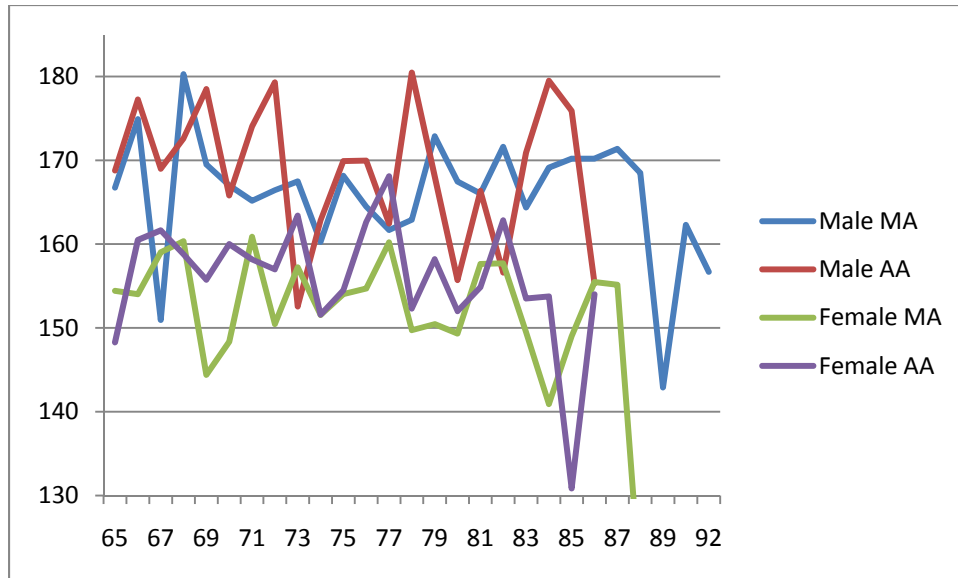


Figure 57: Arm Span

Upper Hand Height

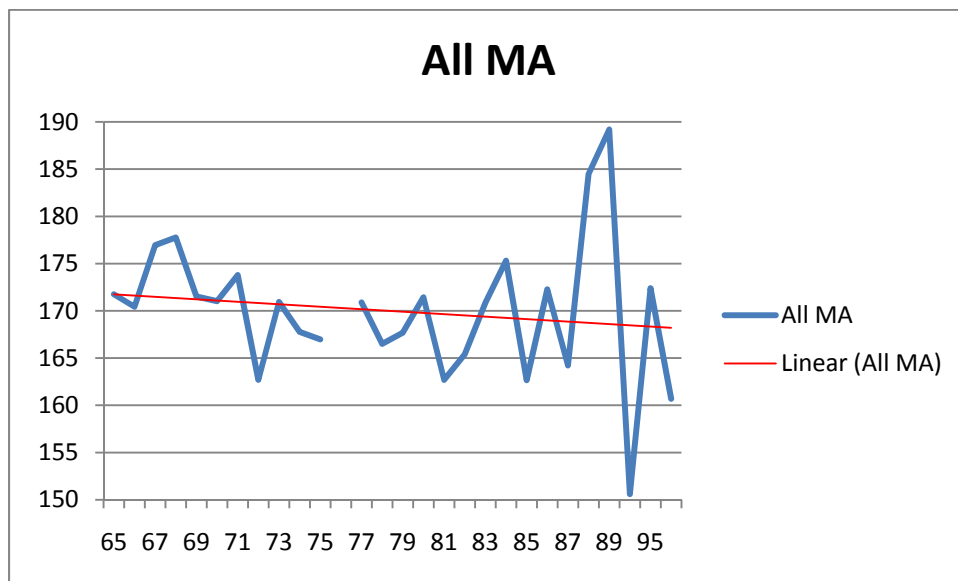


Figure 58: Upper Hand Height

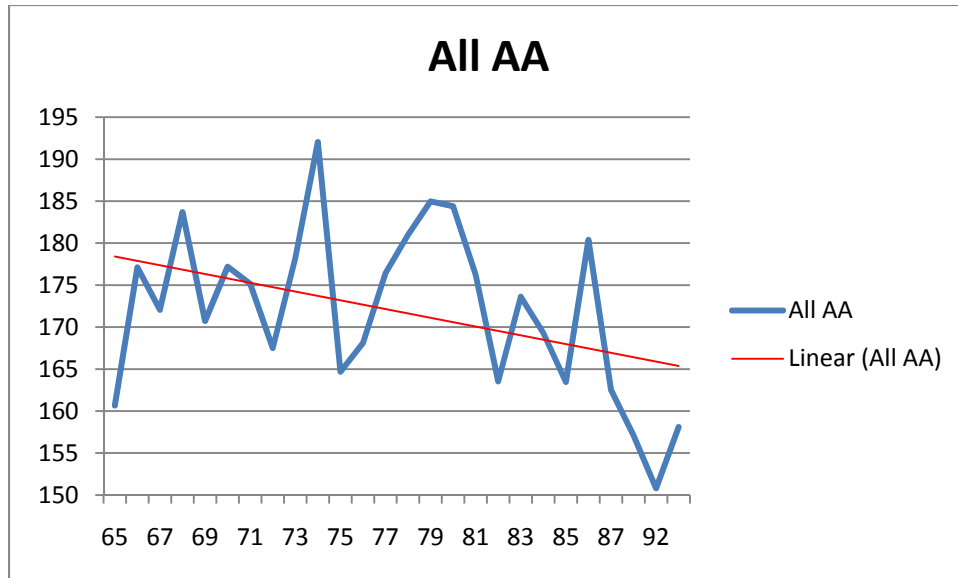


Figure 59: Upper Hand Height

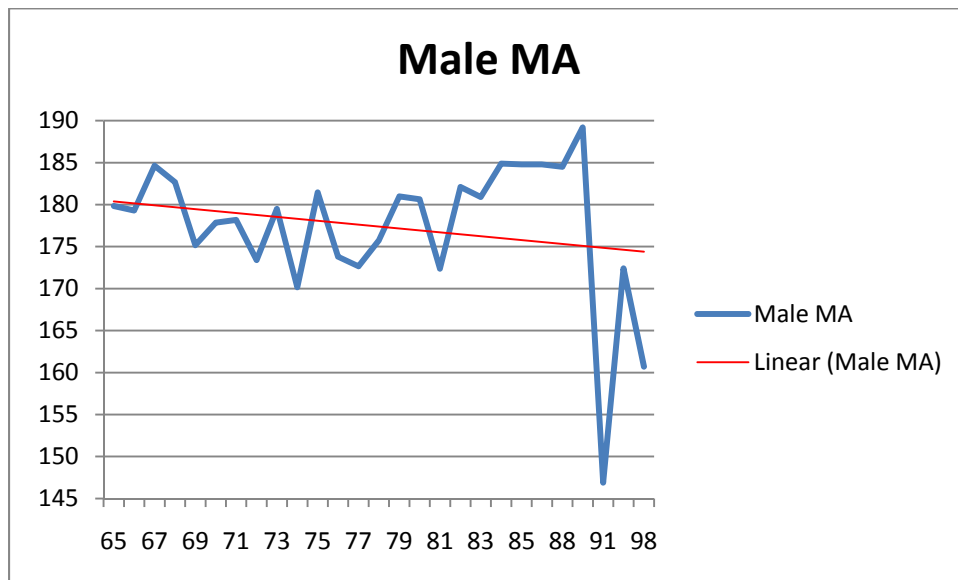


Figure 60: Upper Hand Height

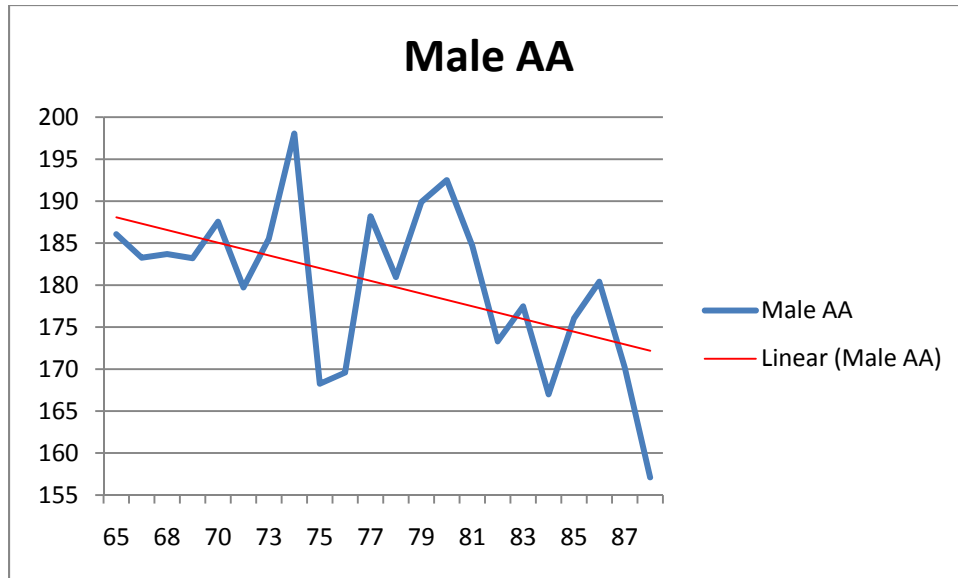


Figure 61: Upper Hand Height

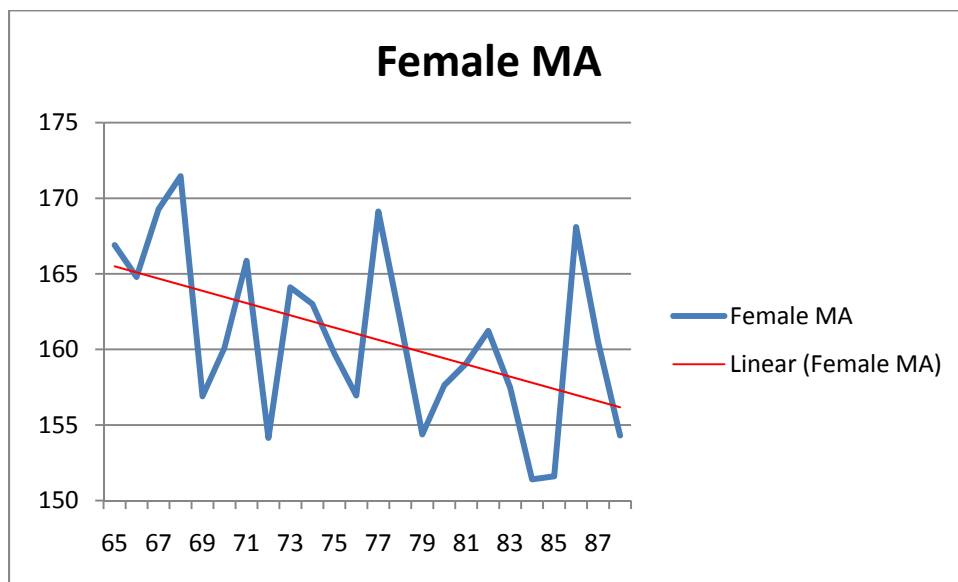


Figure 62: Upper Hand Height

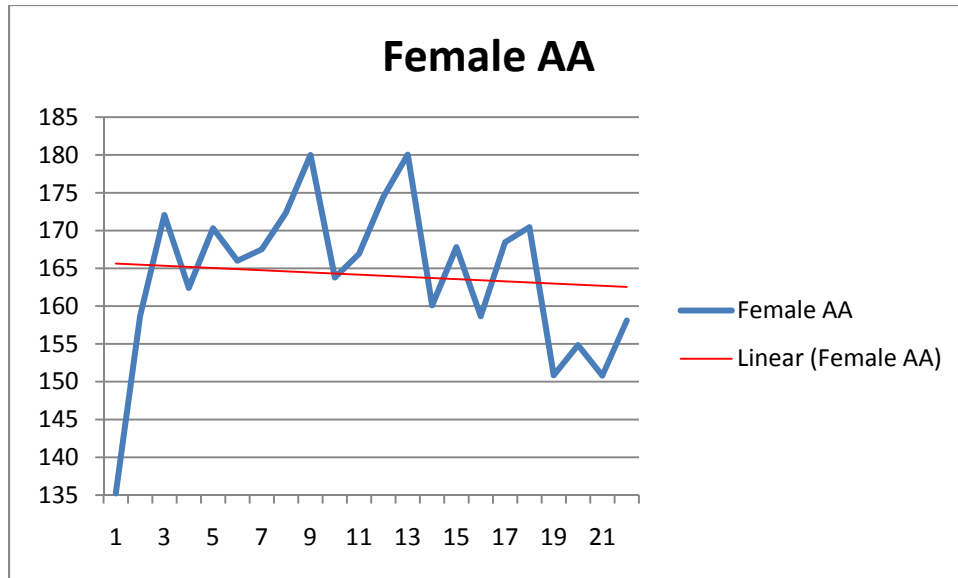


Figure 63: Upper Hand Height

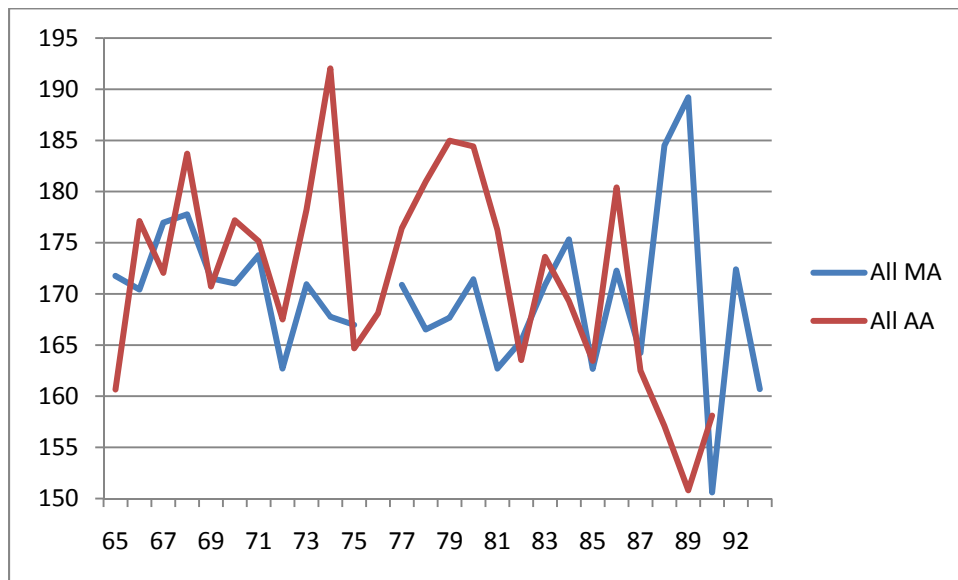


Figure 64: Upper Hand Height

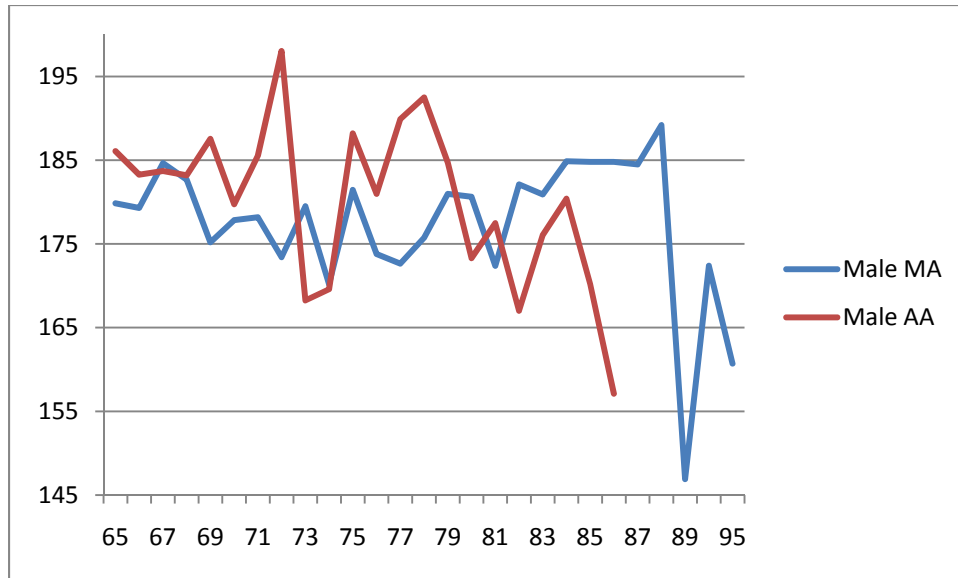


Figure 65: Upper Hand Height

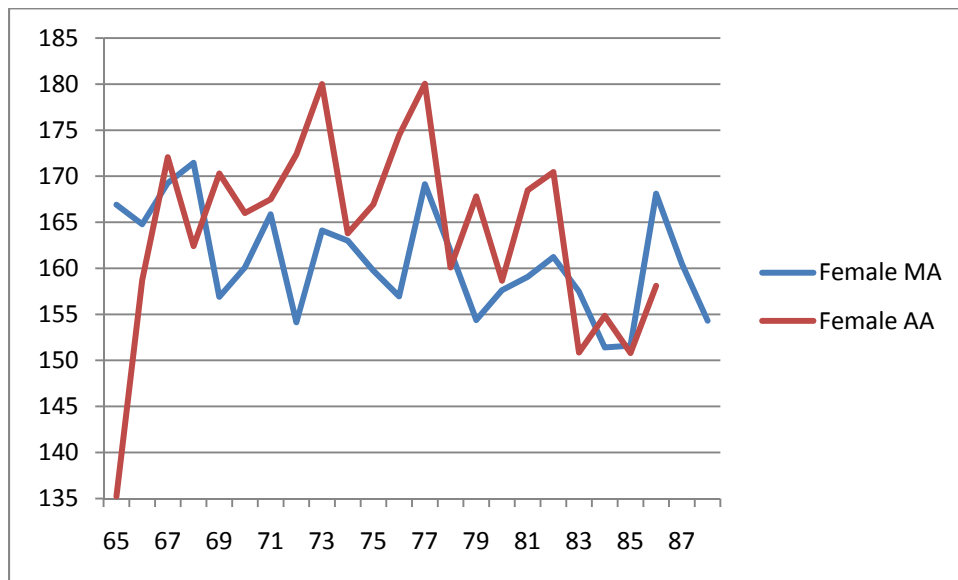


Figure 66: Upper Hand Height

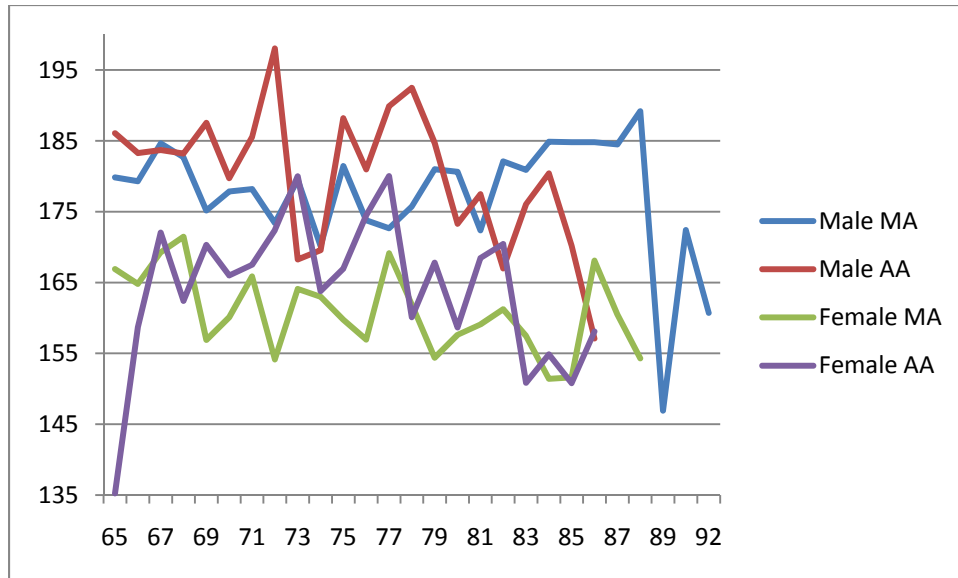


Figure 67: Upper Hand Height

Lower Hand Height

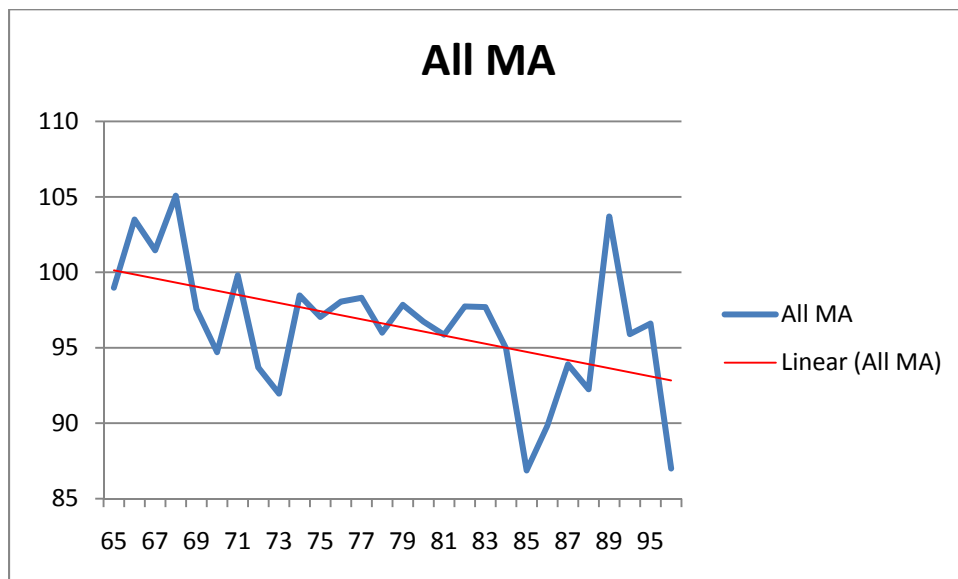


Figure 68: Lower Hand Height

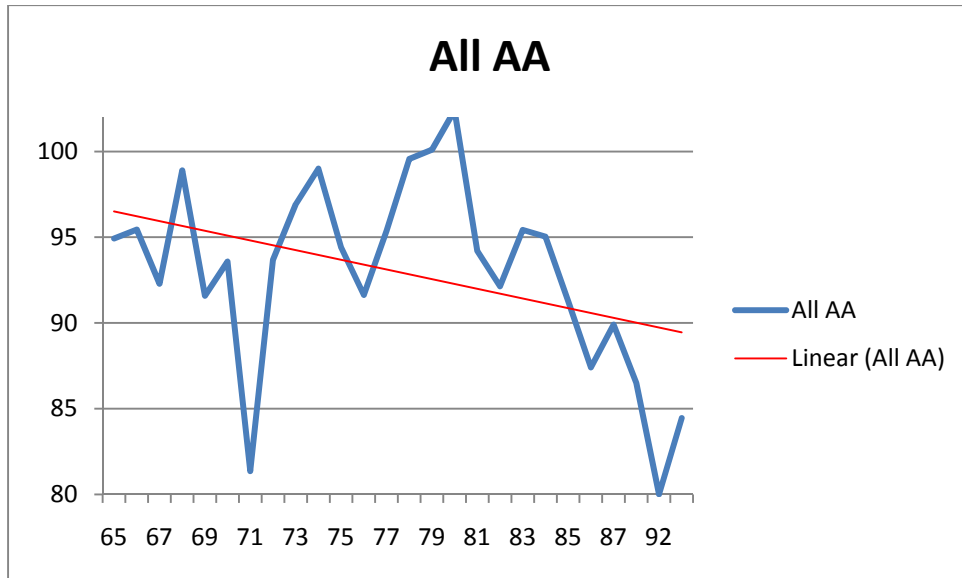


Figure 69: Lower Hand Height

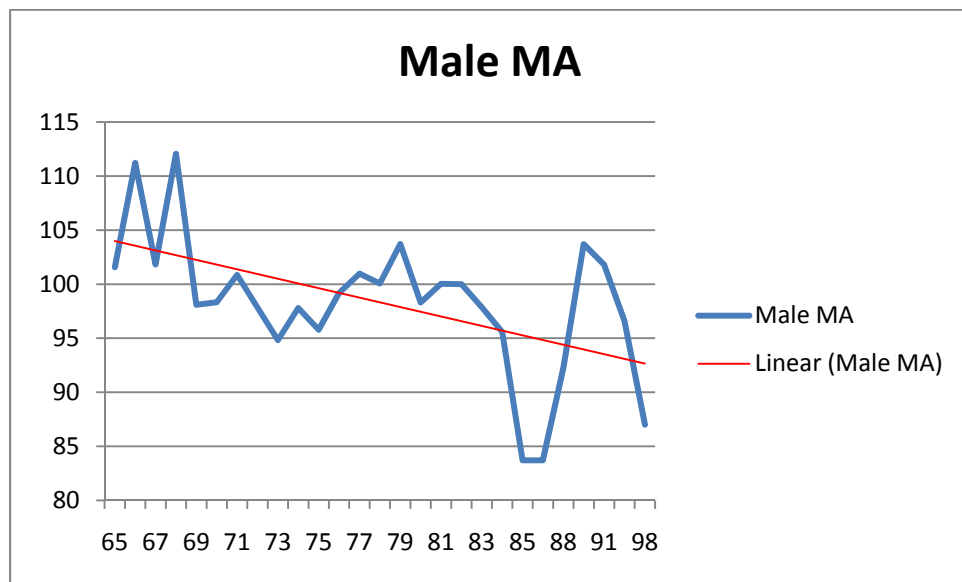


Figure 70: Lower Hand Height

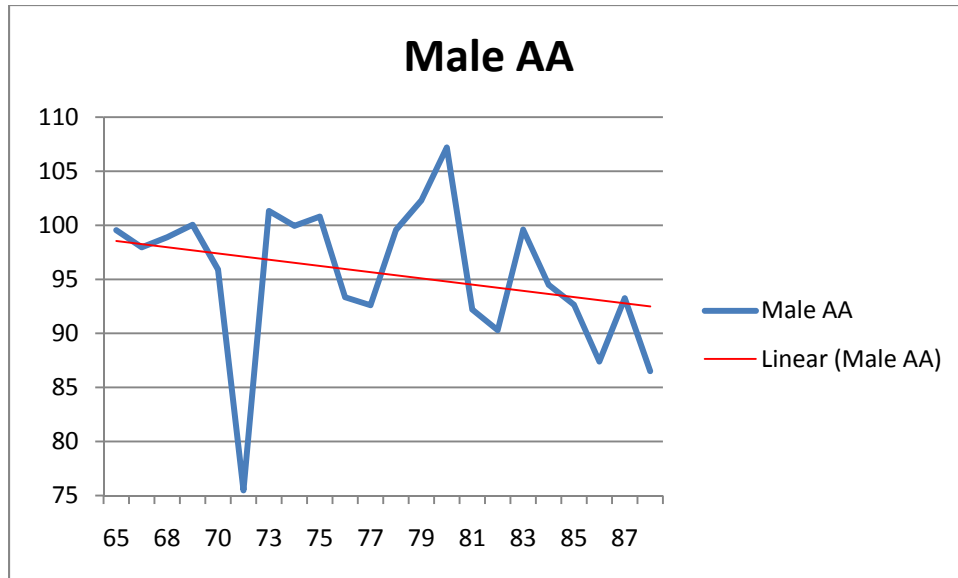


Figure 71: Lower Hand Height

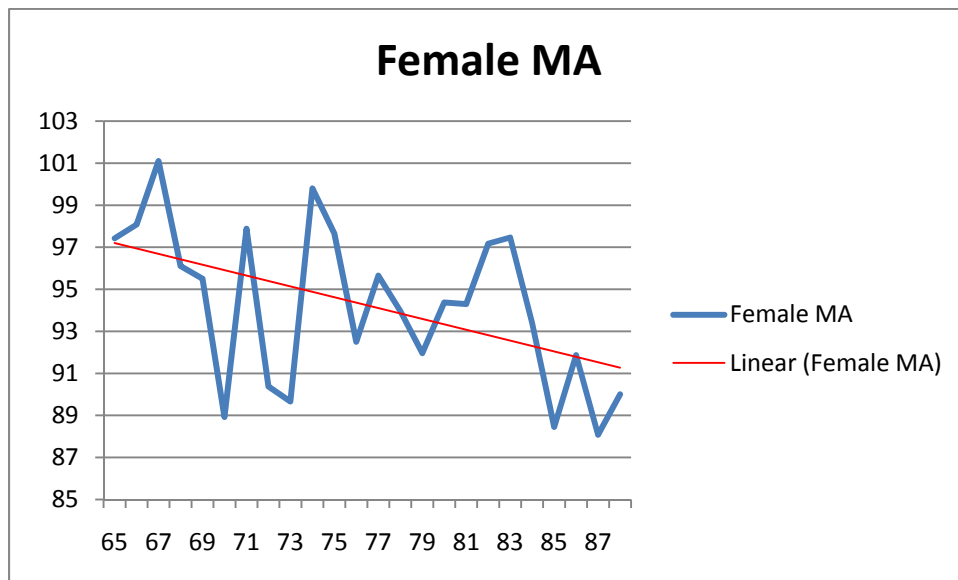


Figure 72: Lower Hand Height

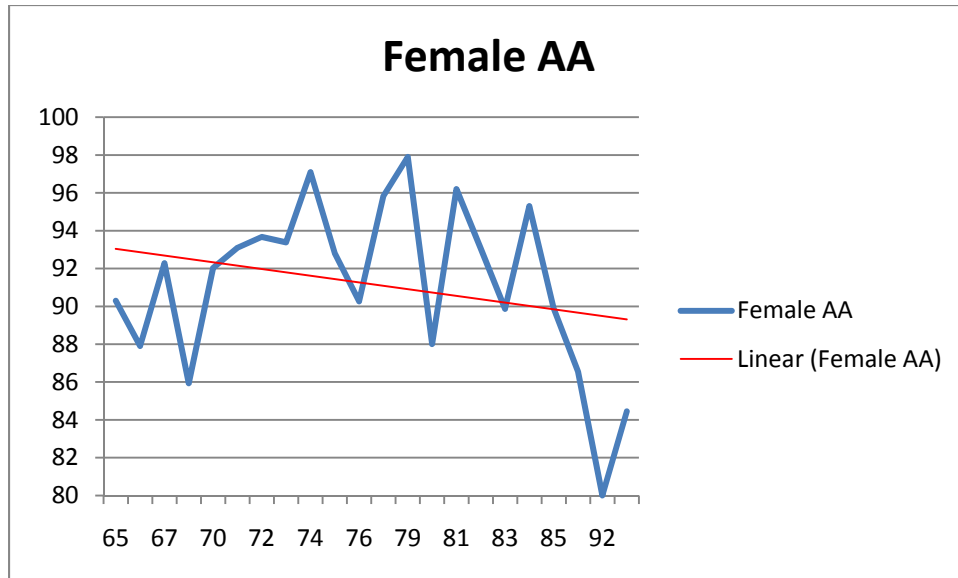


Figure 73: Lower Hand Height

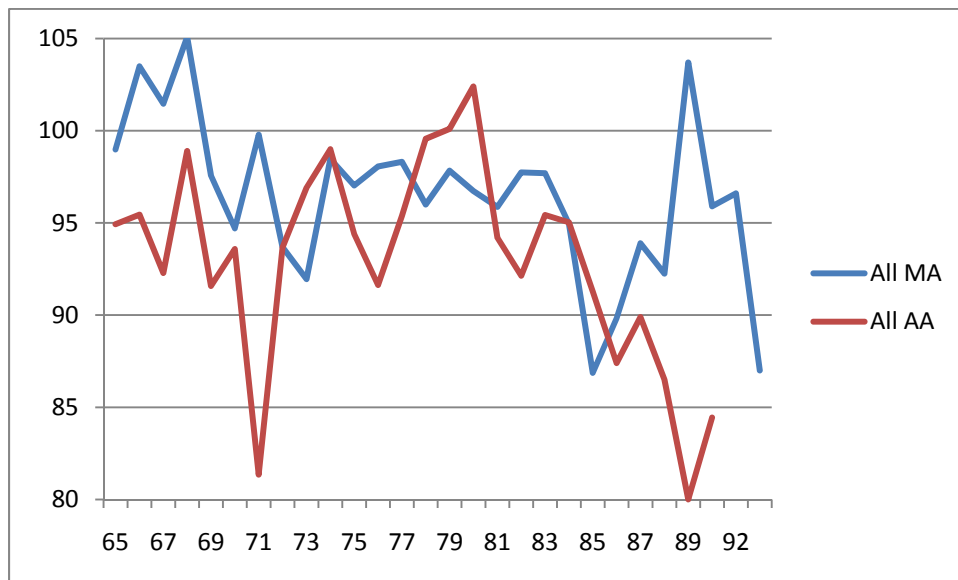


Figure 74: Lower Hand Height

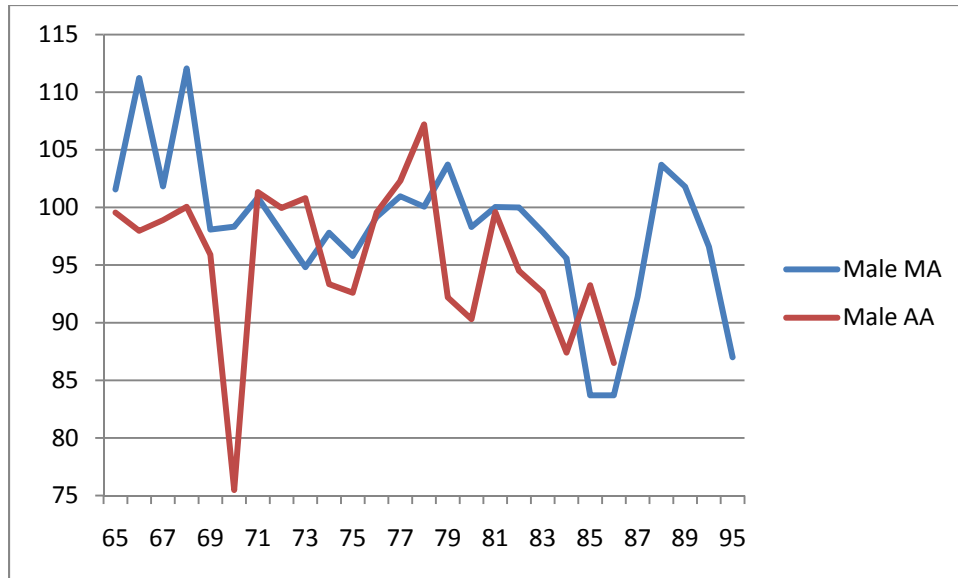


Figure 75: Lower Hand Height

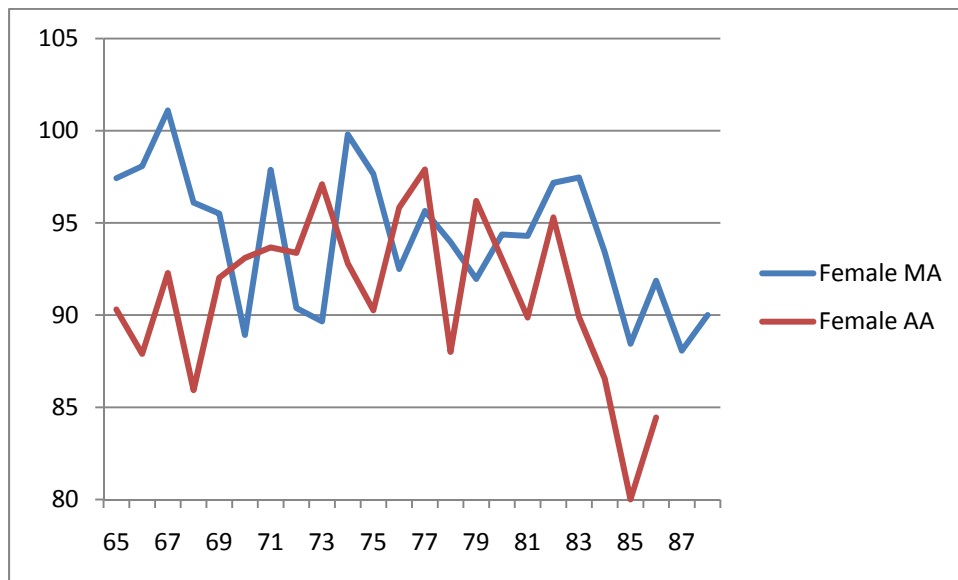


Figure 76: Lower Hand Height

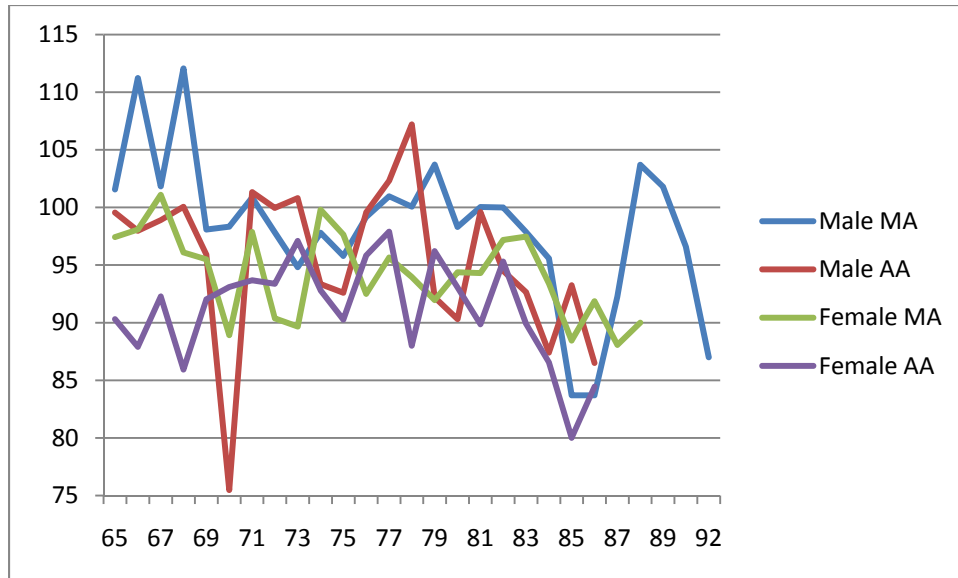


Figure 77: Lower Hand Height

Vertical Reach Distance

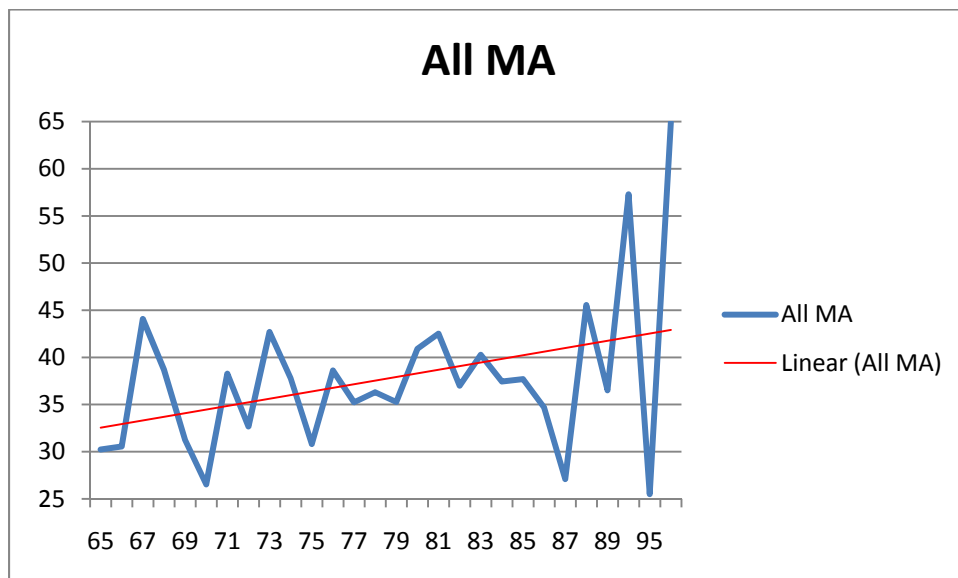


Figure 78: Vertical Reach Distance

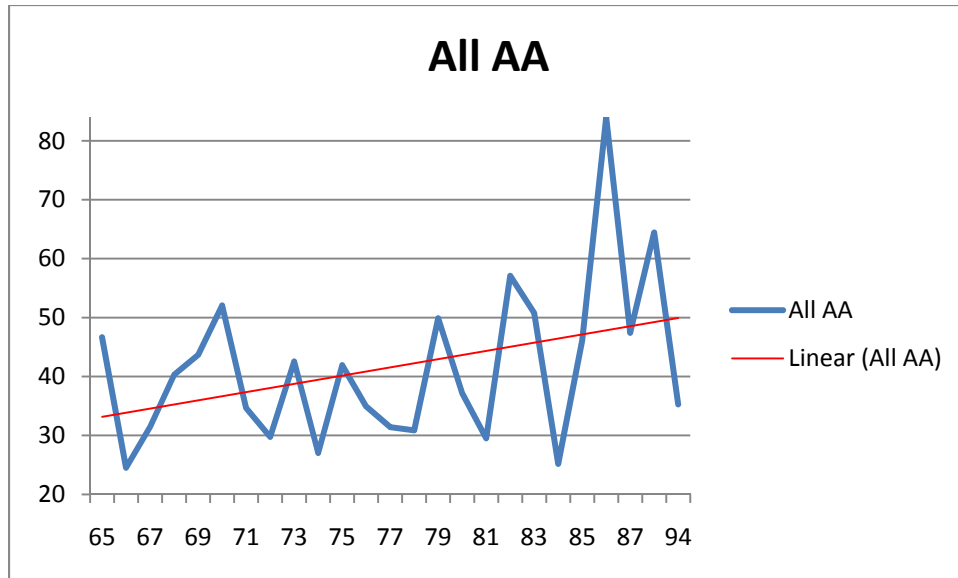


Figure 79: Vertical Reach Distance

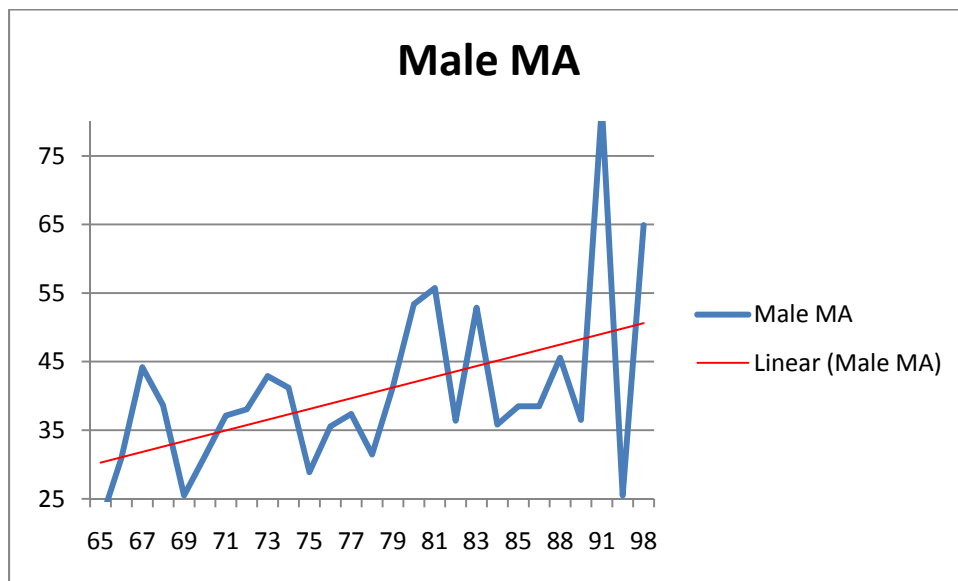


Figure 80: Vertical Reach Distance

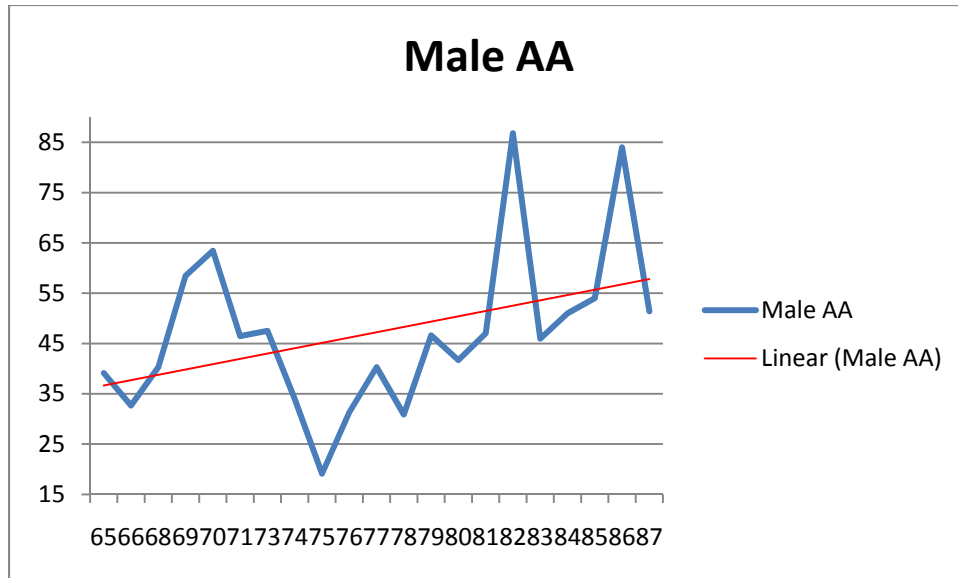


Figure 81: Vertical Reach Distance

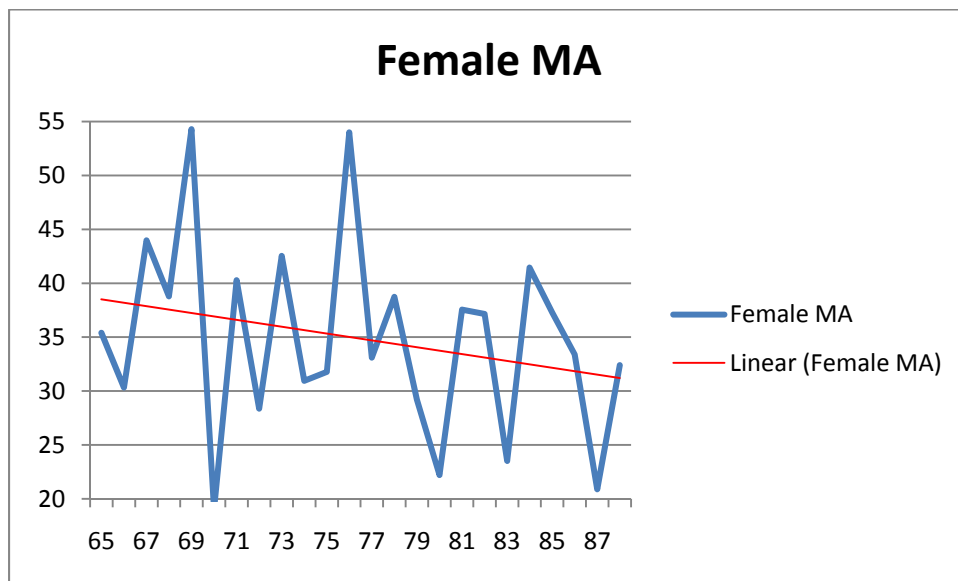


Figure 82: Vertical Reach Distance

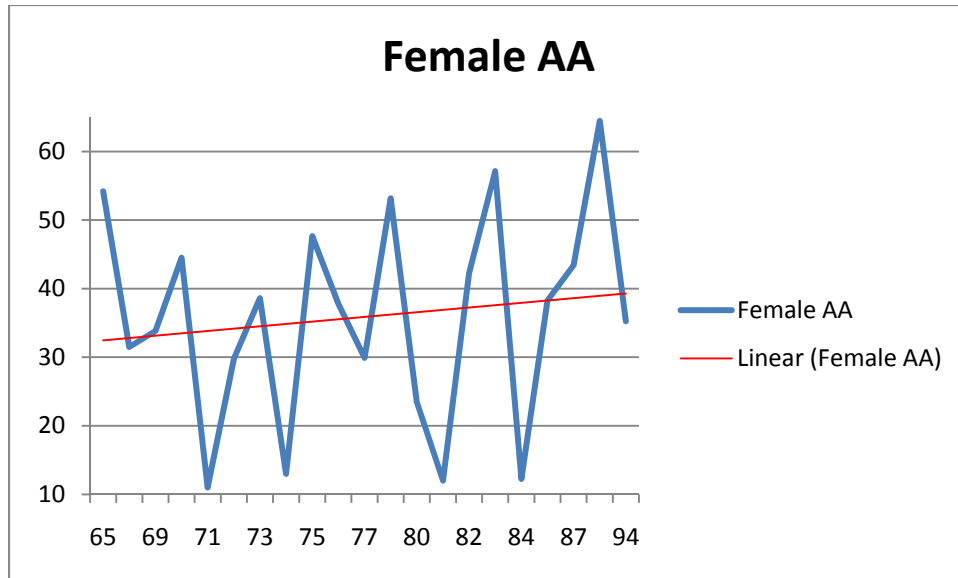


Figure 83: Vertical Reach Distance

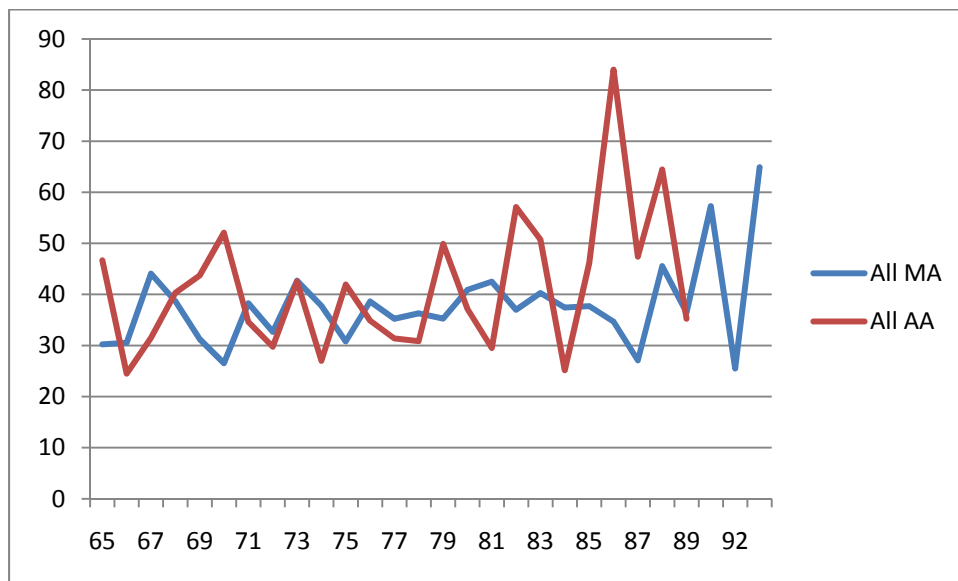


Figure 84: Vertical Reach Distance

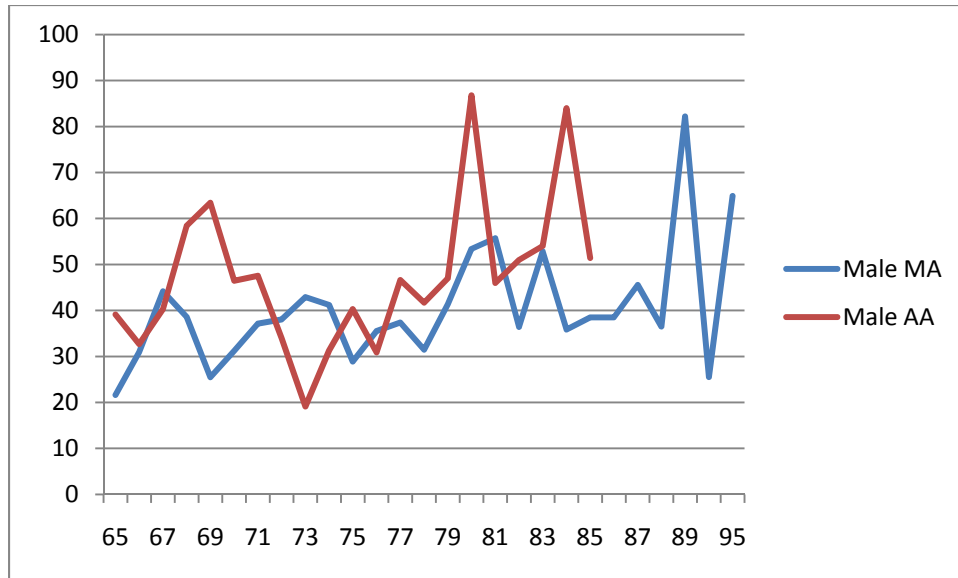


Figure 85: Vertical Reach Distance

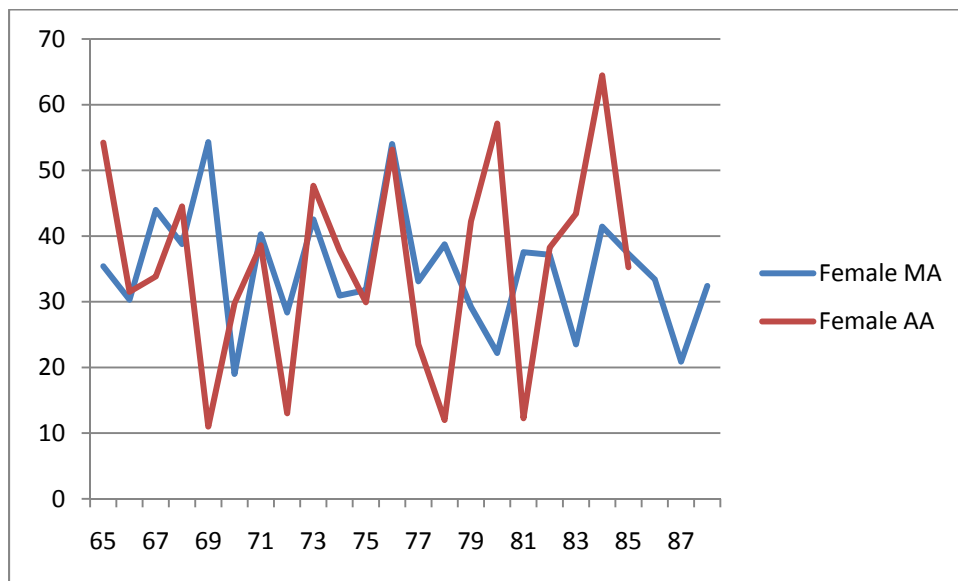


Figure 86: Vertical Reach Distance

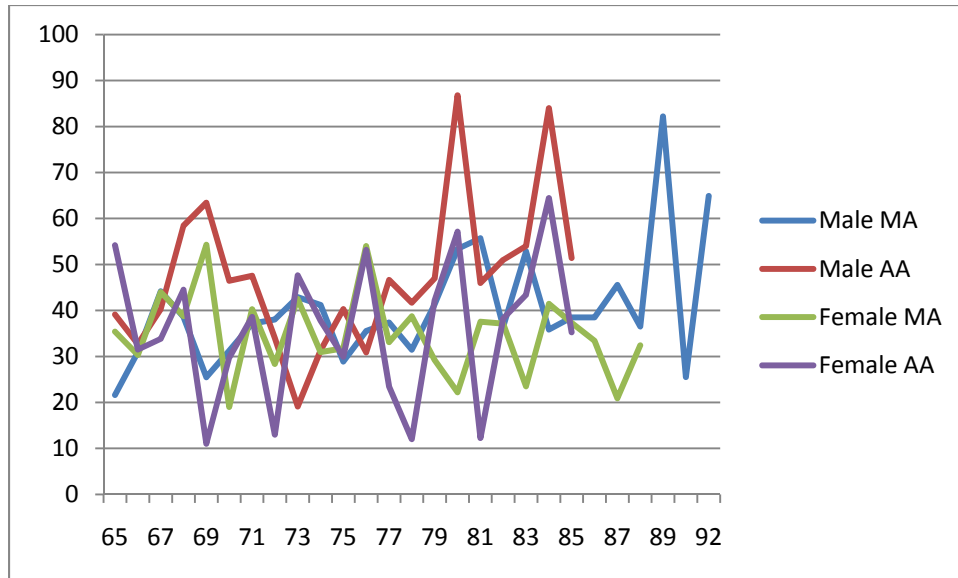


Figure 87: Vertical Reach Distance

Horizontal Distance From Buttock to HandForward Fingertip Reach

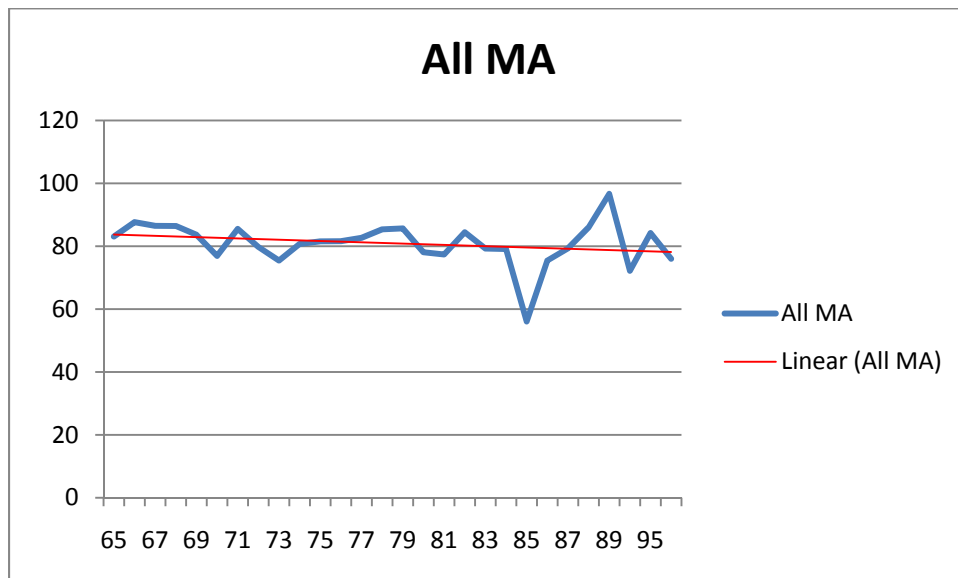


Figure 88: Horizontal Distance From Buttock to HandForward Fingertip Reach

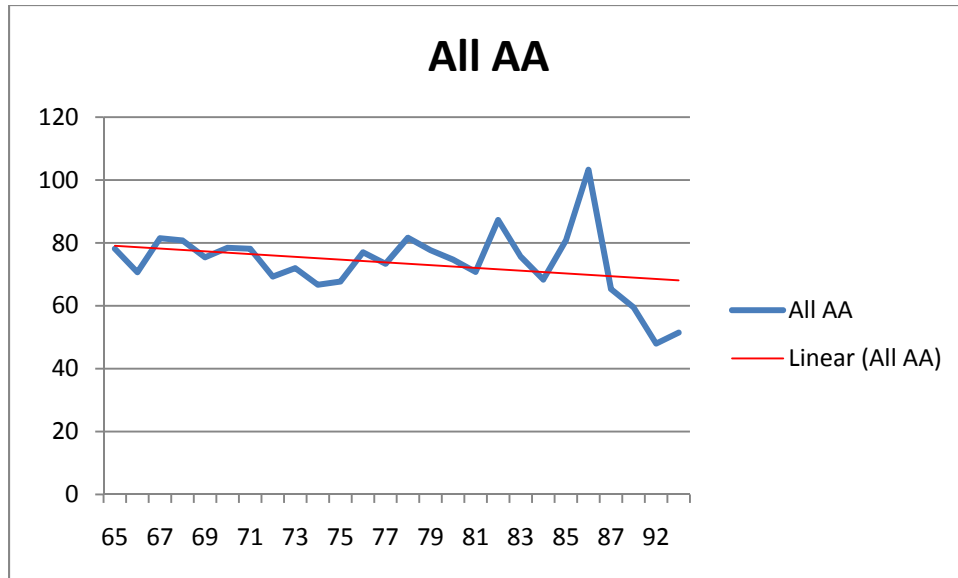


Figure 89: Horizontal Distance From Buttock to HandForward Fingertip Reach

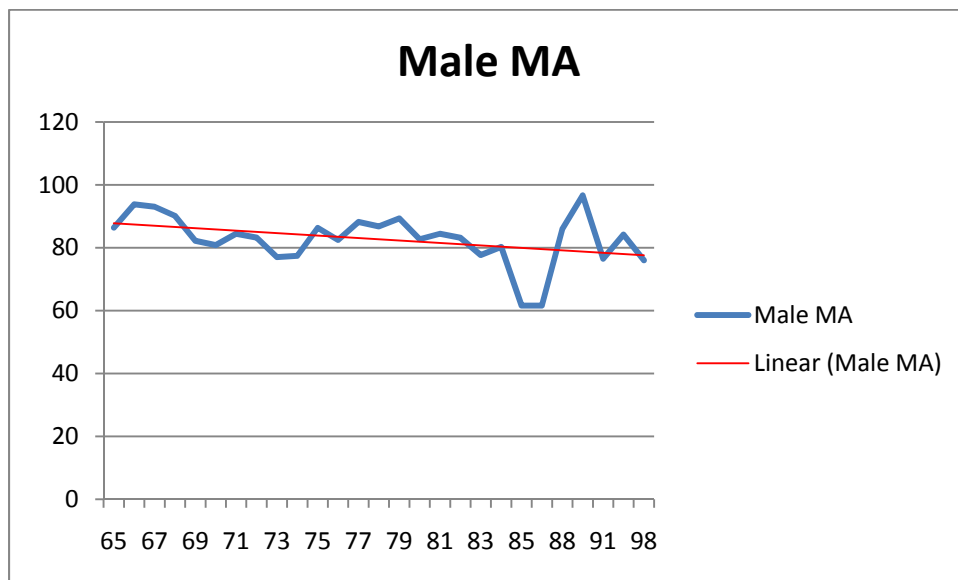


Figure 90: Horizontal Distance From Buttock to HandForward Fingertip Reach

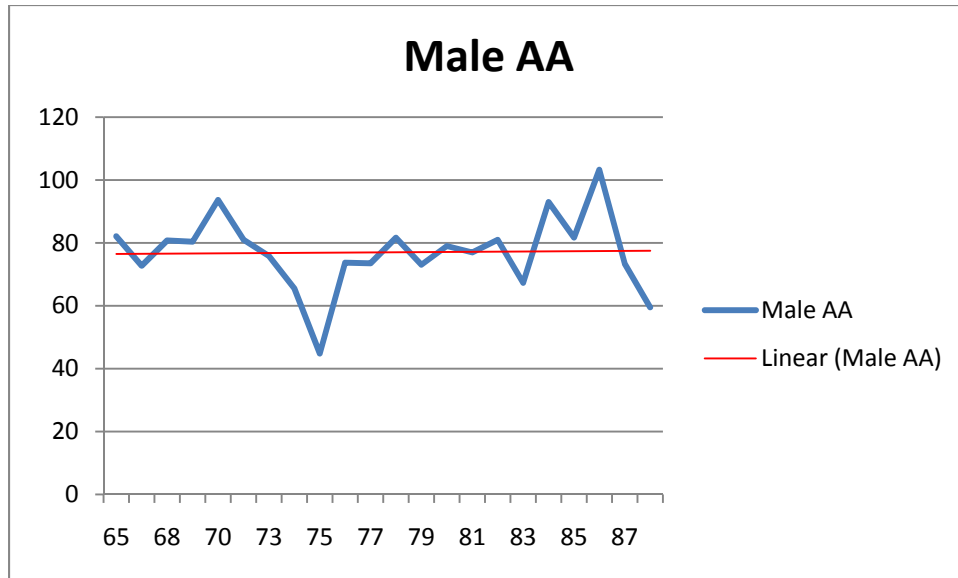


Figure 91: Horizontal Distance From Buttock to HandForward Fingertip Reach

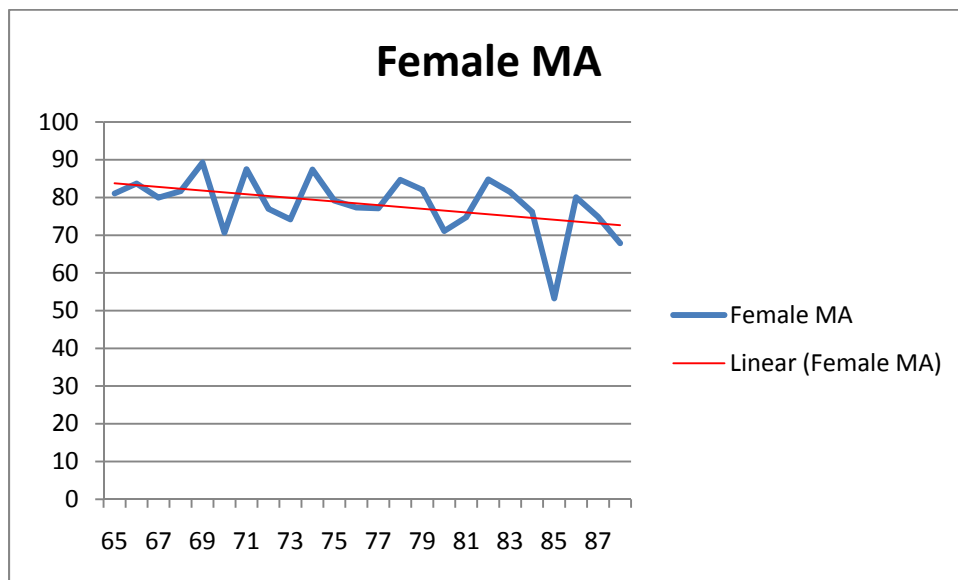


Figure 92: Horizontal Distance From Buttock to HandForward Fingertip Reach

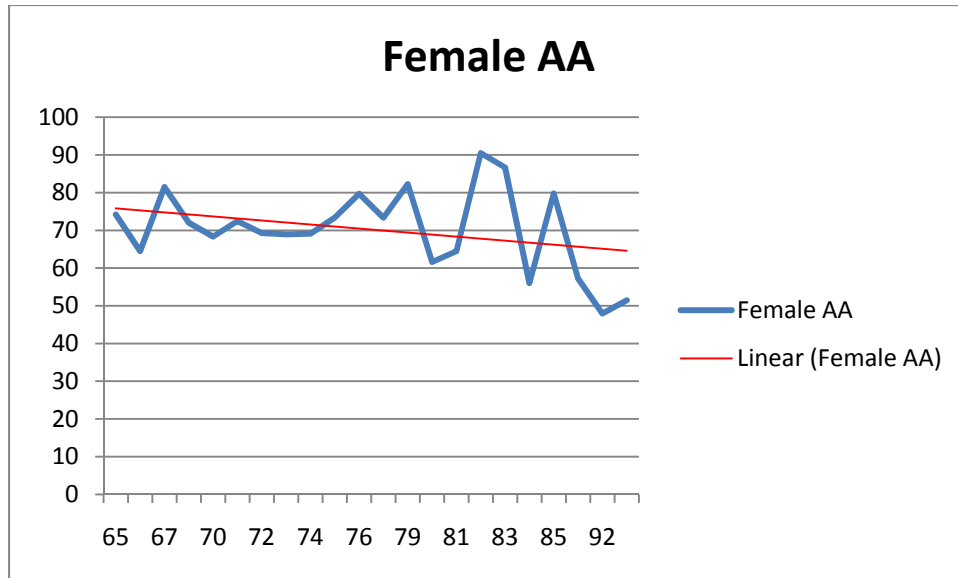


Figure 93: Horizontal Distance From Buttock to HandForward Fingertip Reach

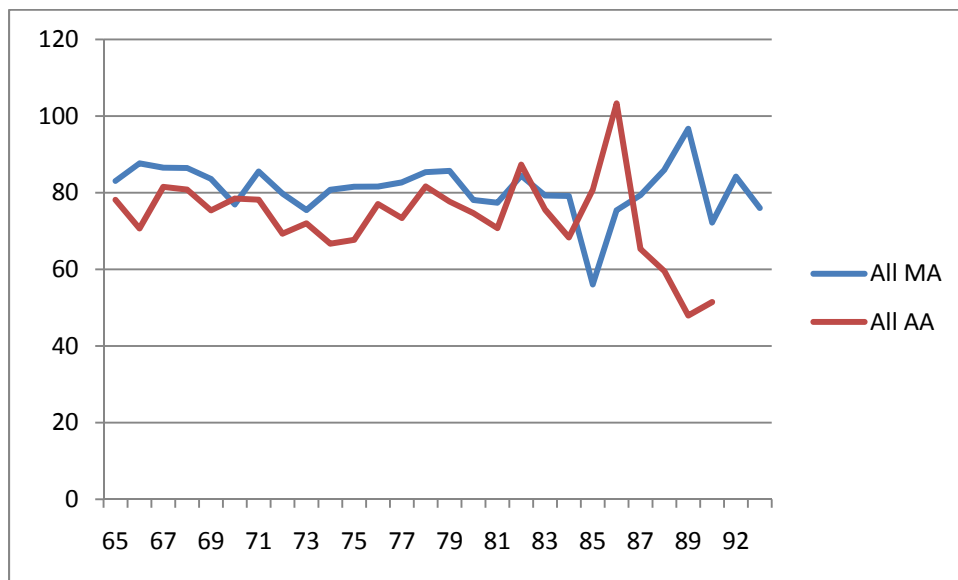


Figure 94: Horizontal Distance From Buttock to HandForward Fingertip Reach

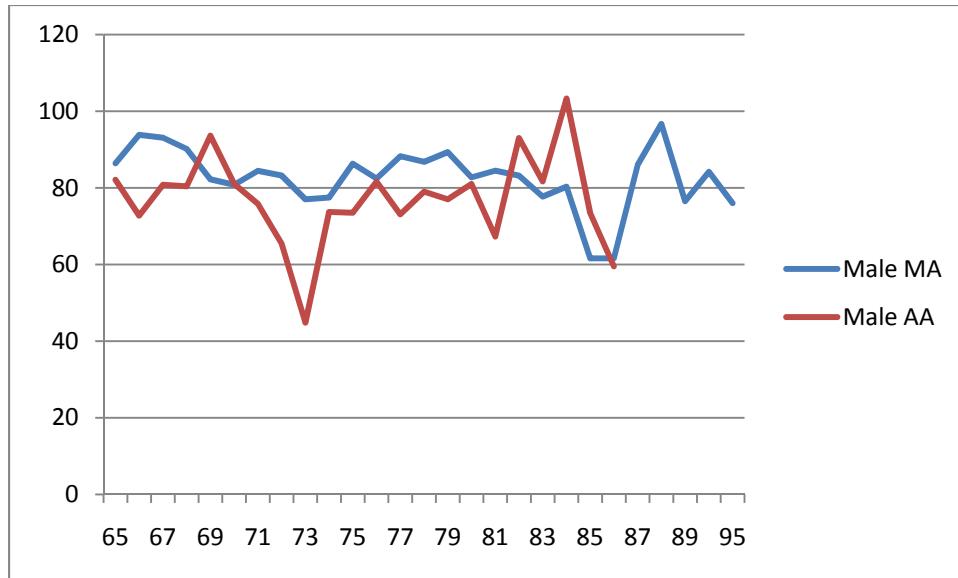


Figure 95: Horizontal Distance From Buttock to Hand Forward Fingertip Reach

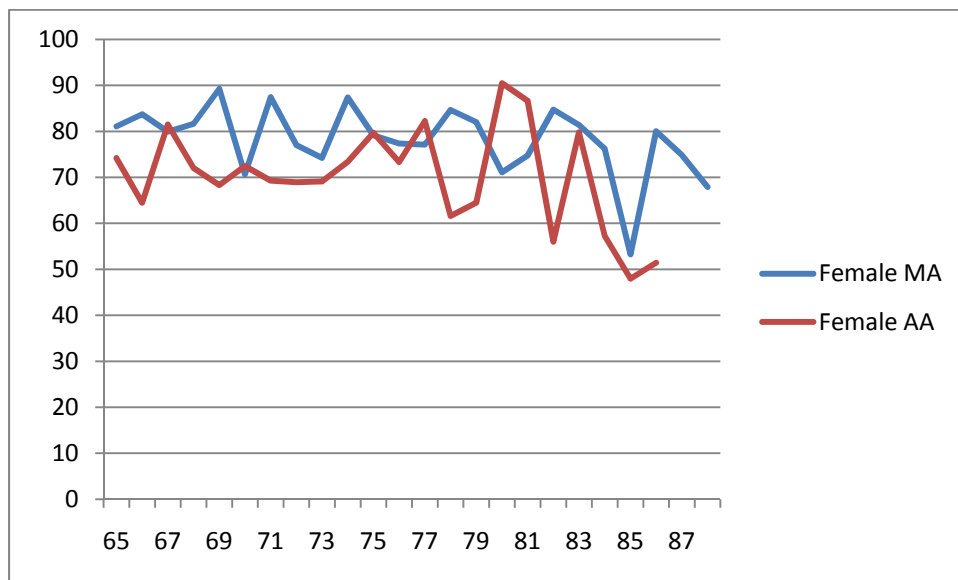


Figure 96: Horizontal Distance From Buttock to Hand Forward Fingertip Reach

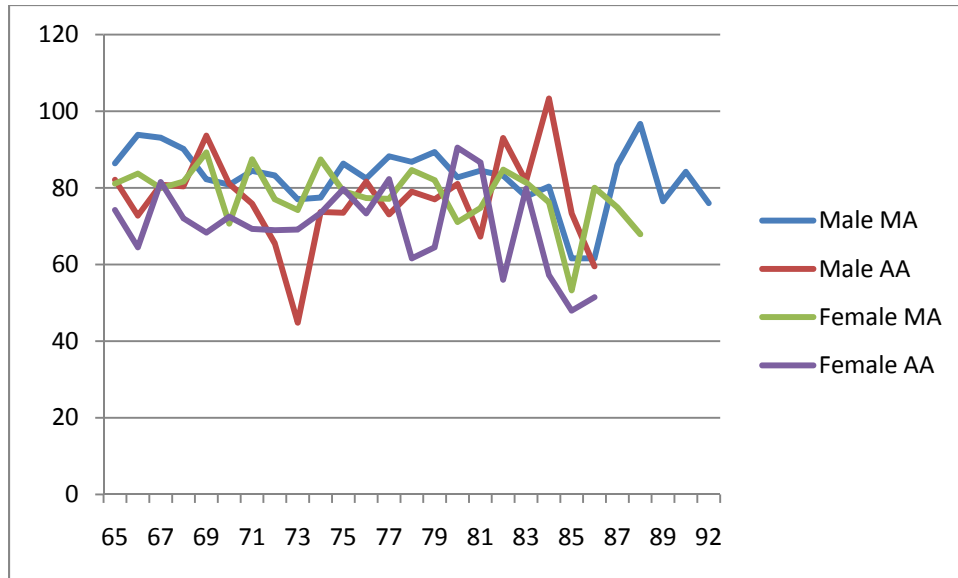


Figure 97: Horizontal Distance From Buttock to Hand Forward Fingertip Reach

Forward Fingertip Reach

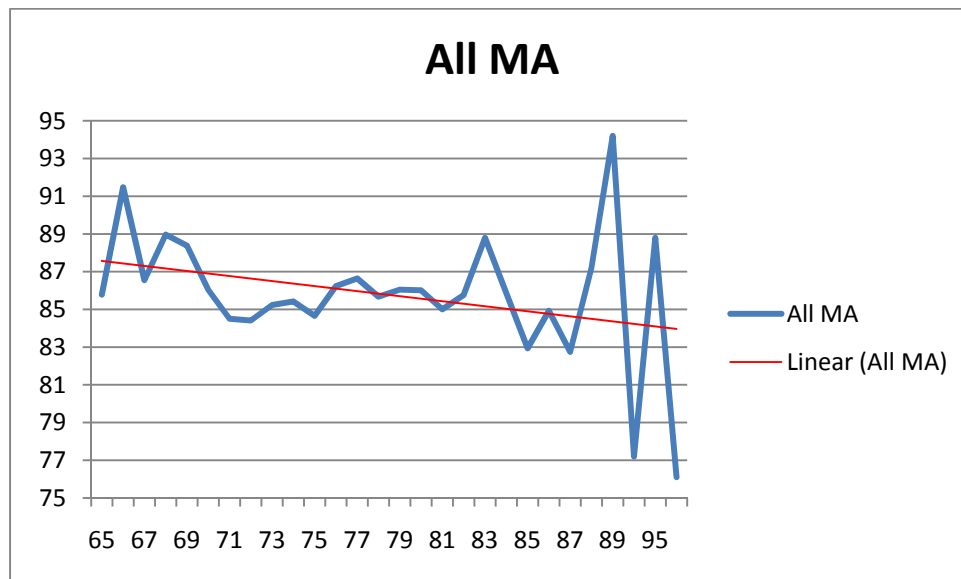


Figure 98: Forward Fingertip Reach

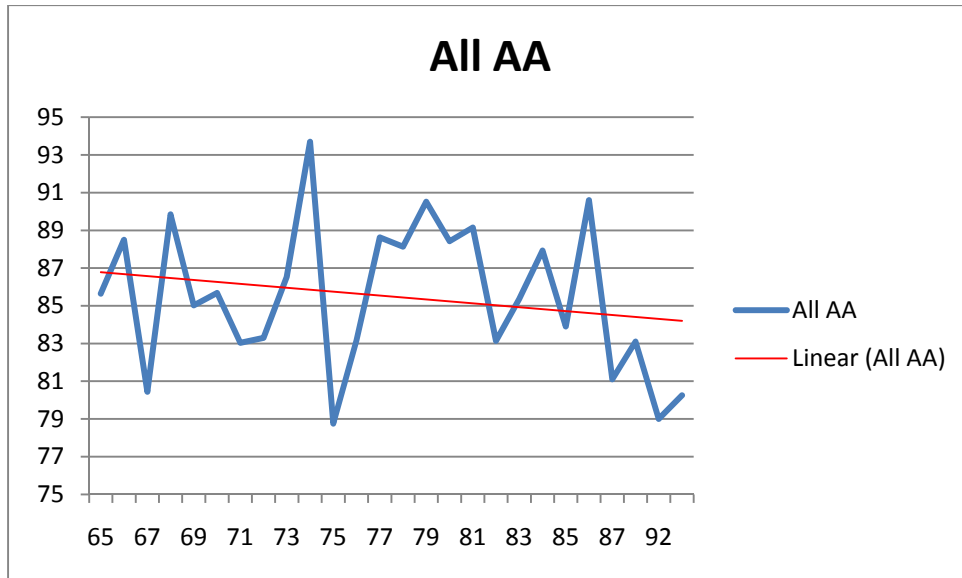


Figure 99: Forward Fingertip Reach

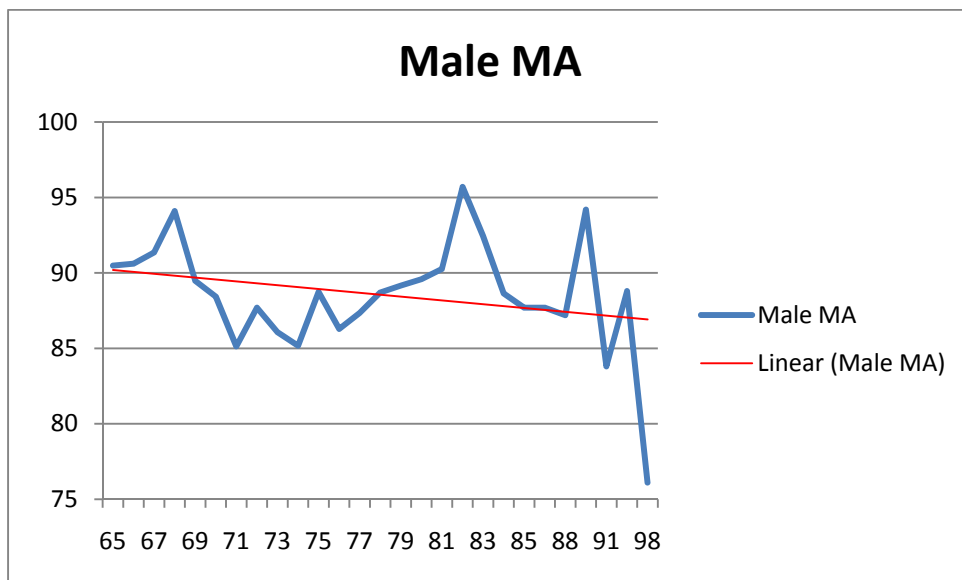


Figure 100: Forward Fingertip Reach

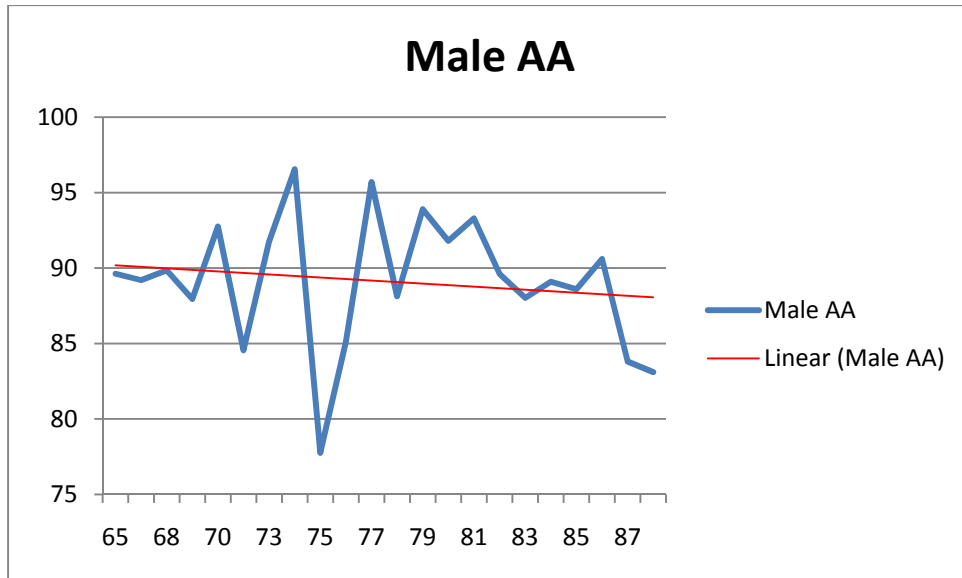


Figure 101: Forward Fingertip Reach

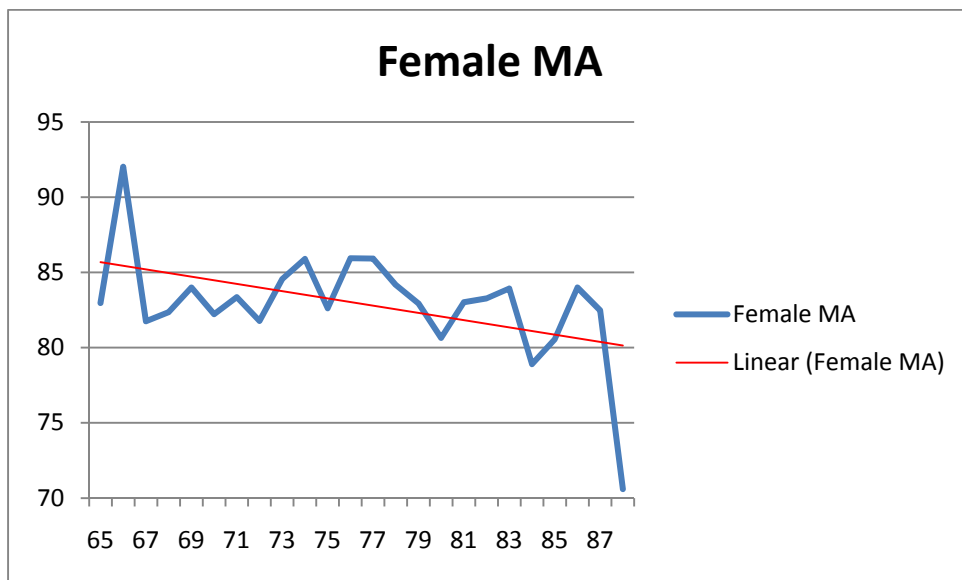


Figure 102: Forward Fingertip Reach

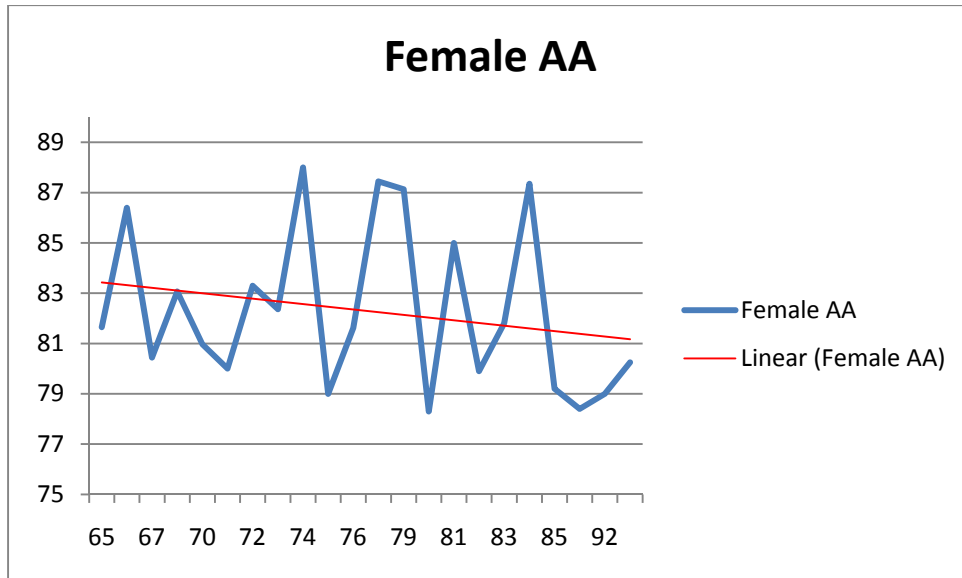


Figure 103: Forward Fingertip Reach

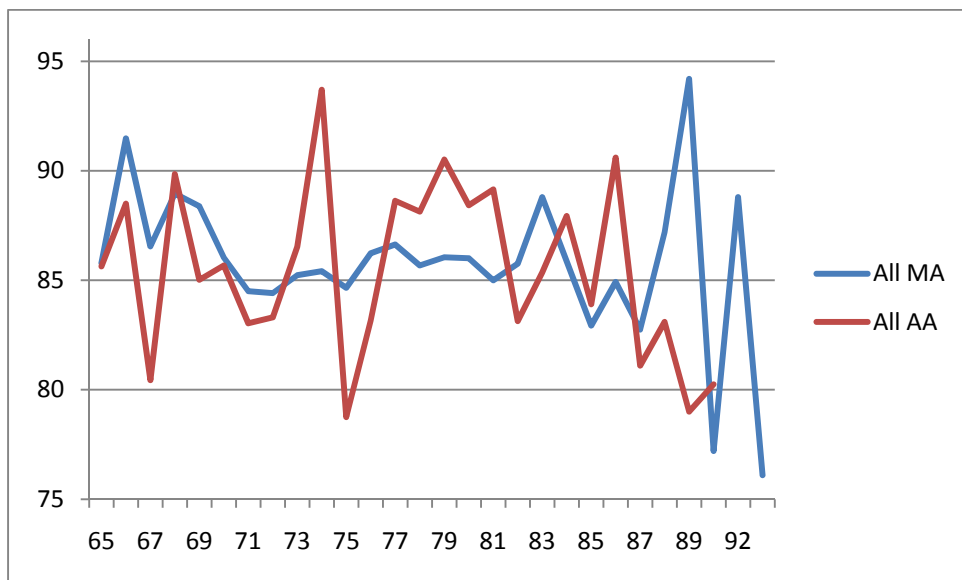


Figure 104: Forward Fingertip Reach

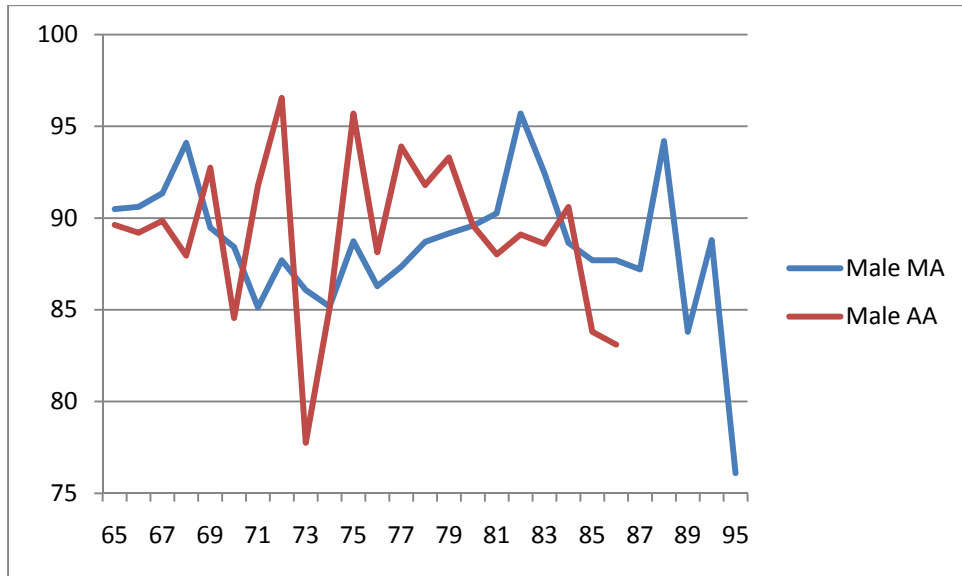


Figure 105: Forward Fingertip Reach

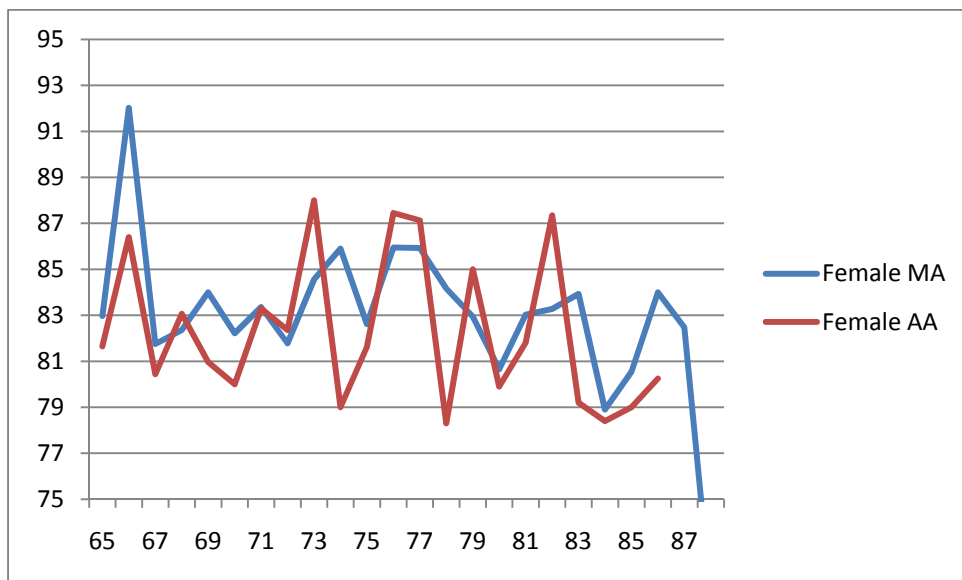


Figure 106: Forward Fingertip Reach

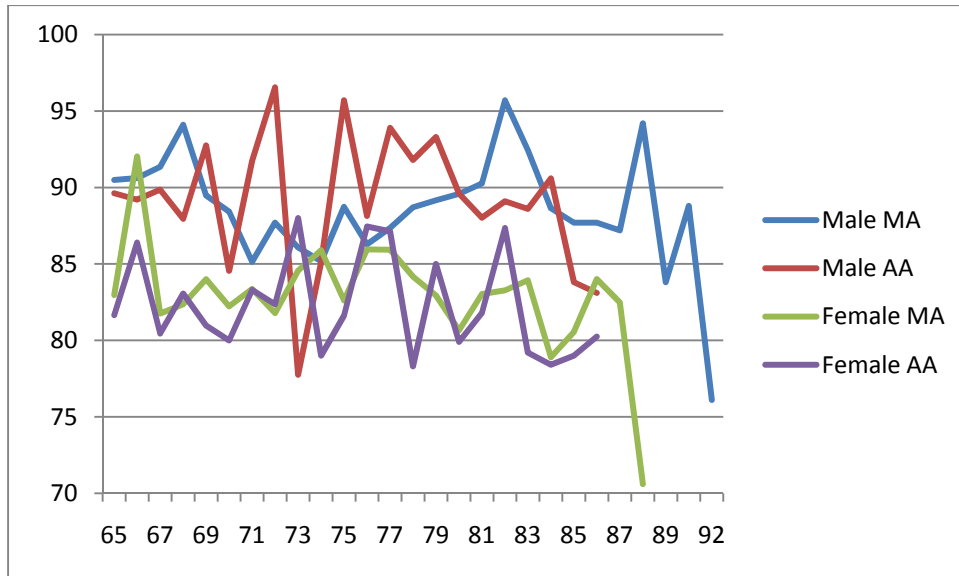


Figure 107: Forward Fingertip Reach

Forward Grip Reach

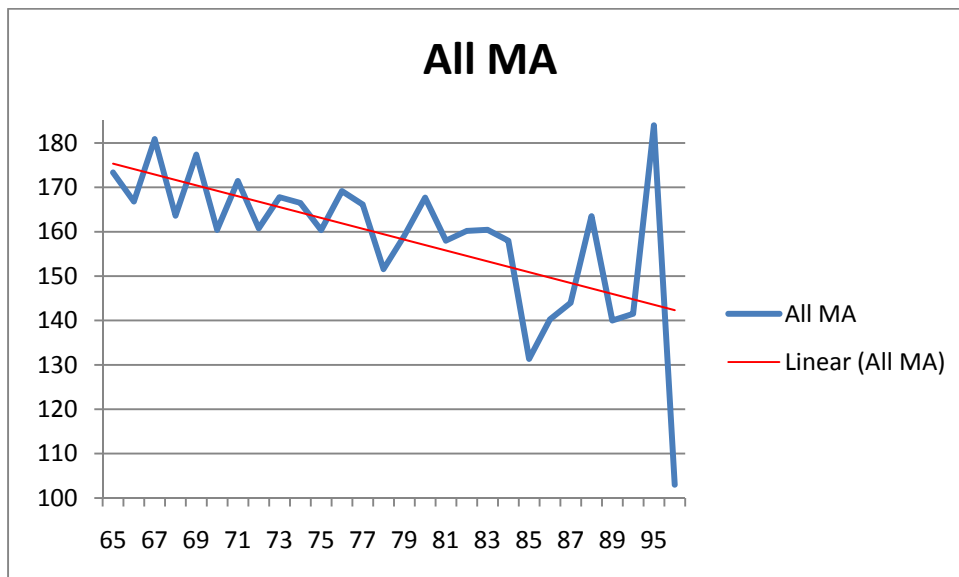


Figure 108: Forward Grip Reach

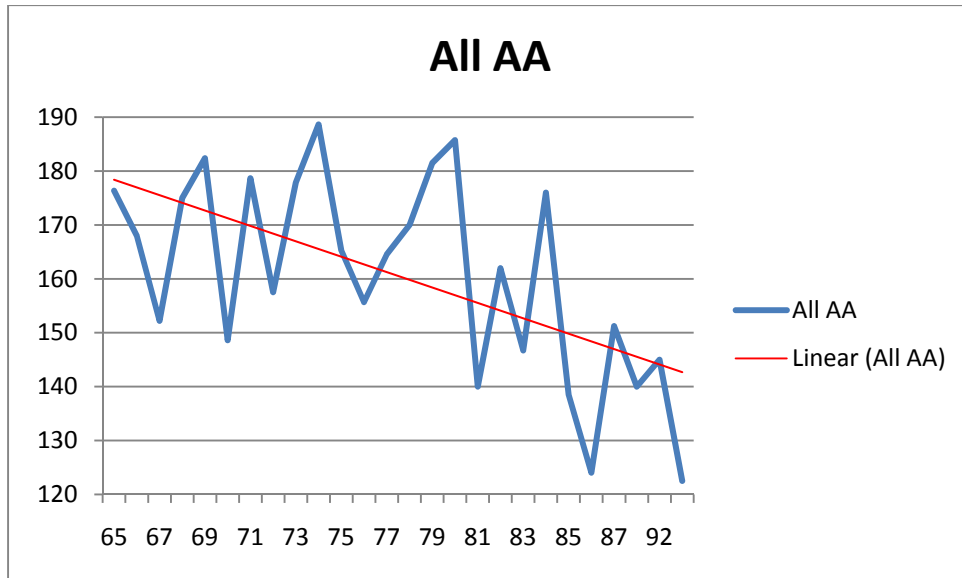


Figure 109: Forward Grip Reach

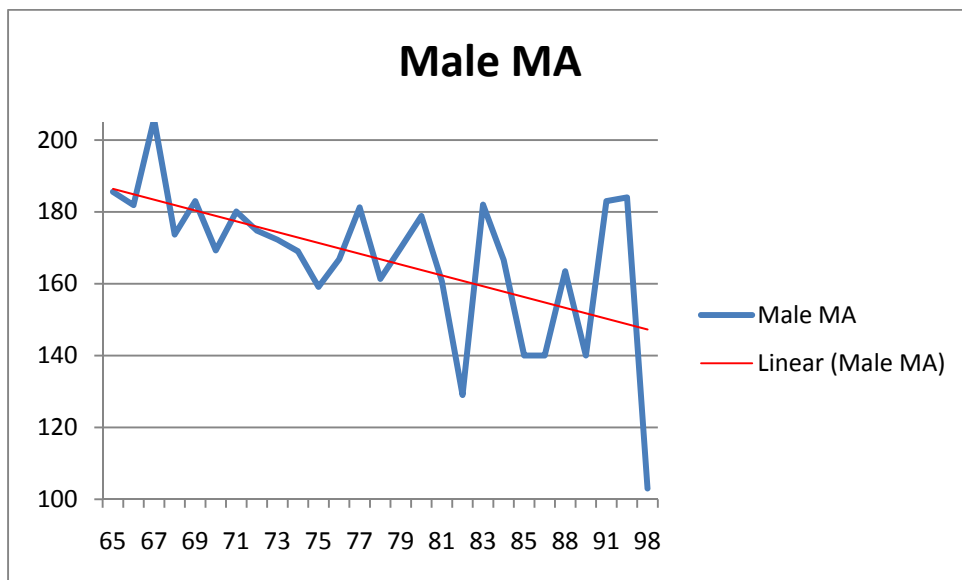


Figure 110: Forward Grip Reach

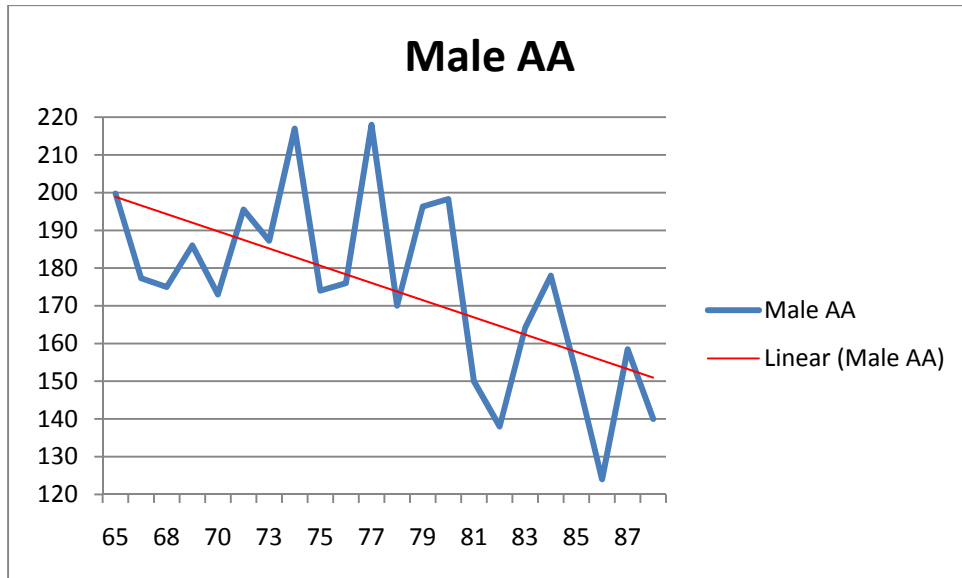


Figure 111: Forward Grip Reach

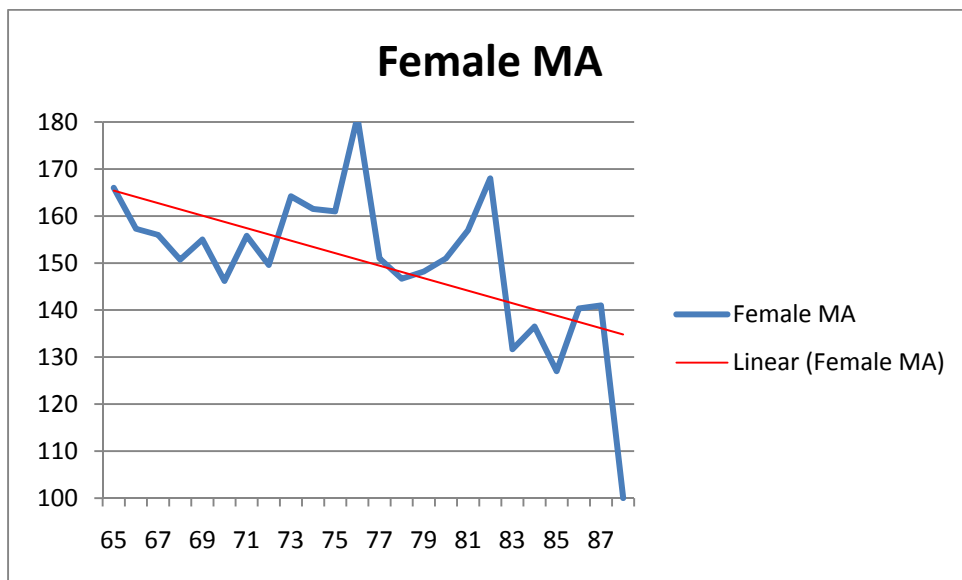


Figure 112: Forward Grip Reach

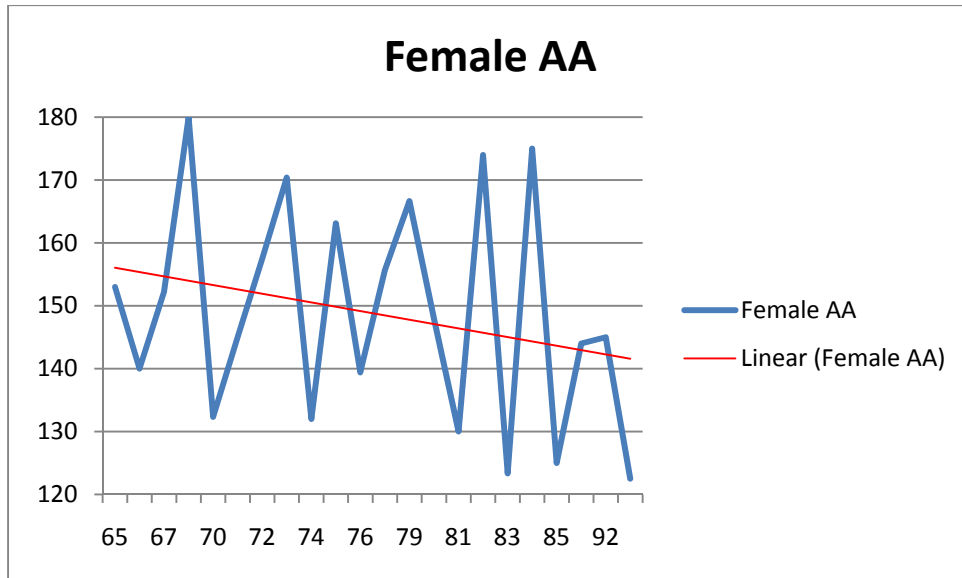


Figure 113: Forward Grip Reach

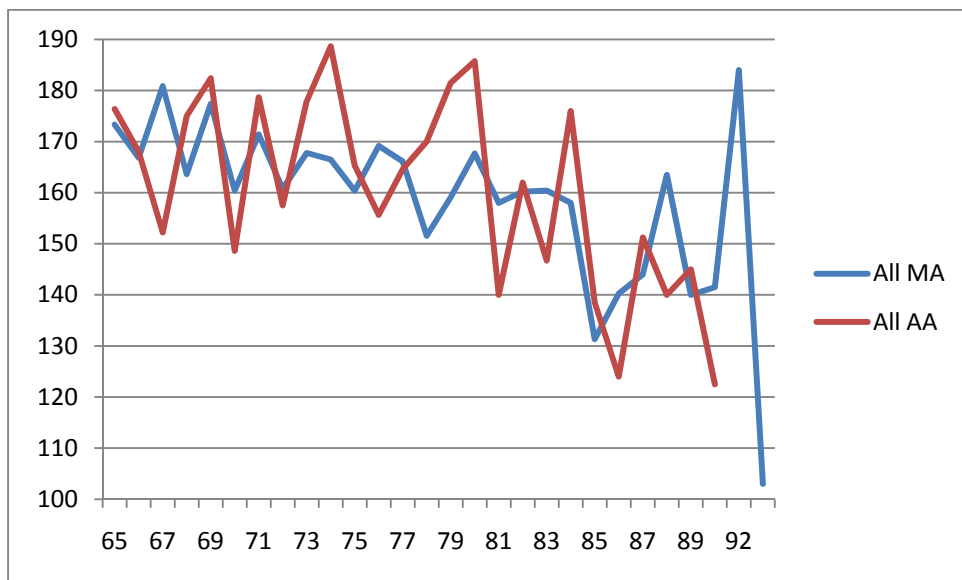


Figure 114: Forward Grip Reach

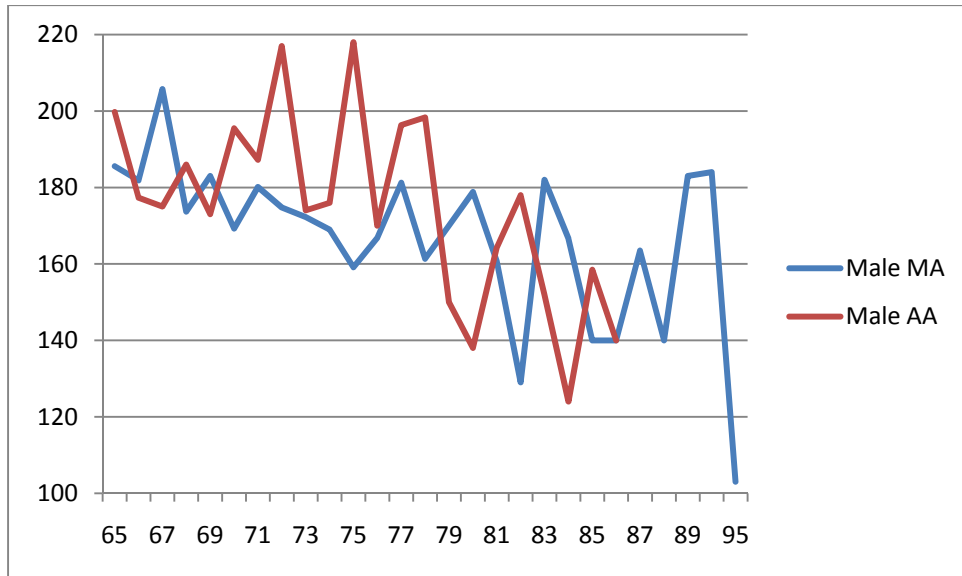


Figure 115: Forward Grip Reach

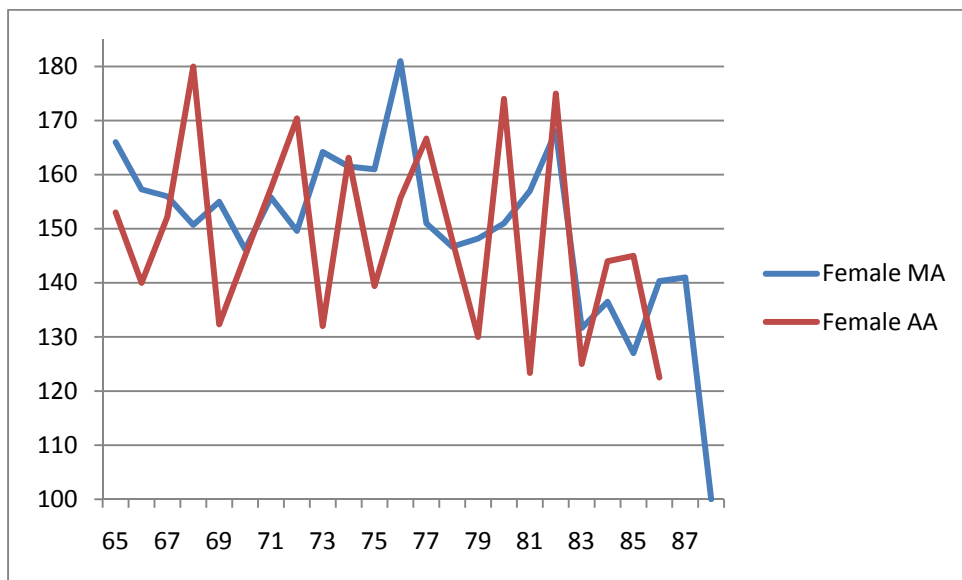


Figure 116: Forward Grip Reach

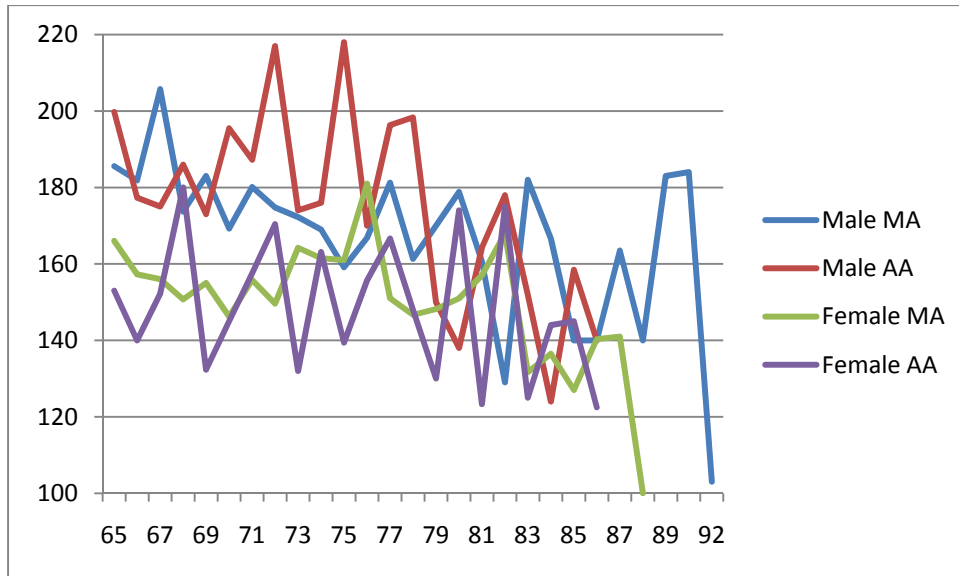


Figure 117: Forward Grip Reach

Rotation of the Head to the Right

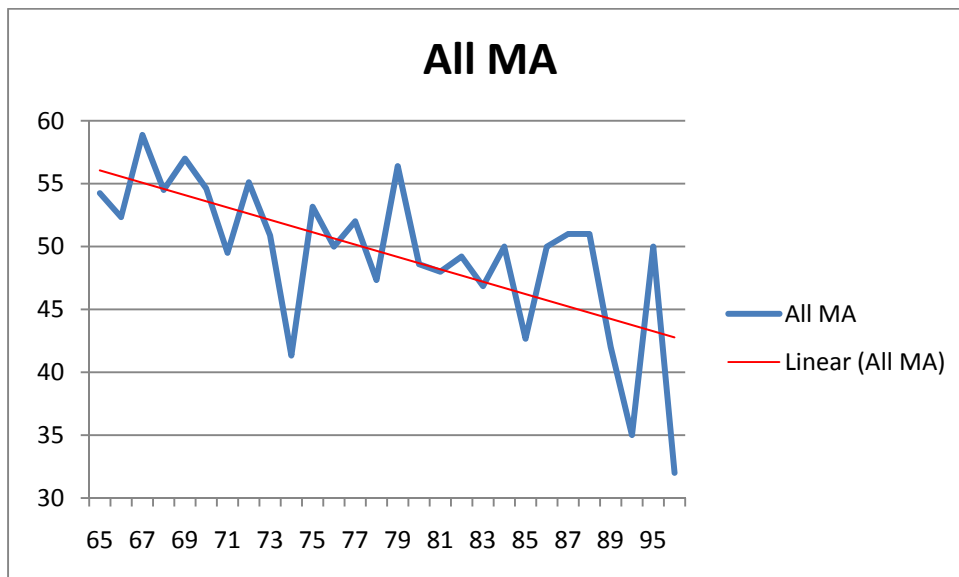


Figure 118: Rotation of the Head to the Right

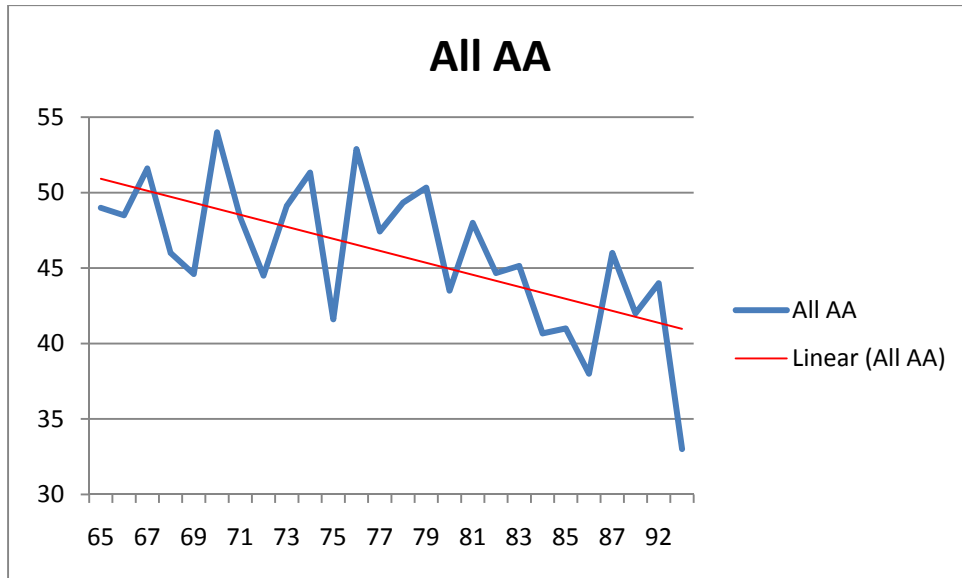


Figure 108: Rotation of the Head to the Right

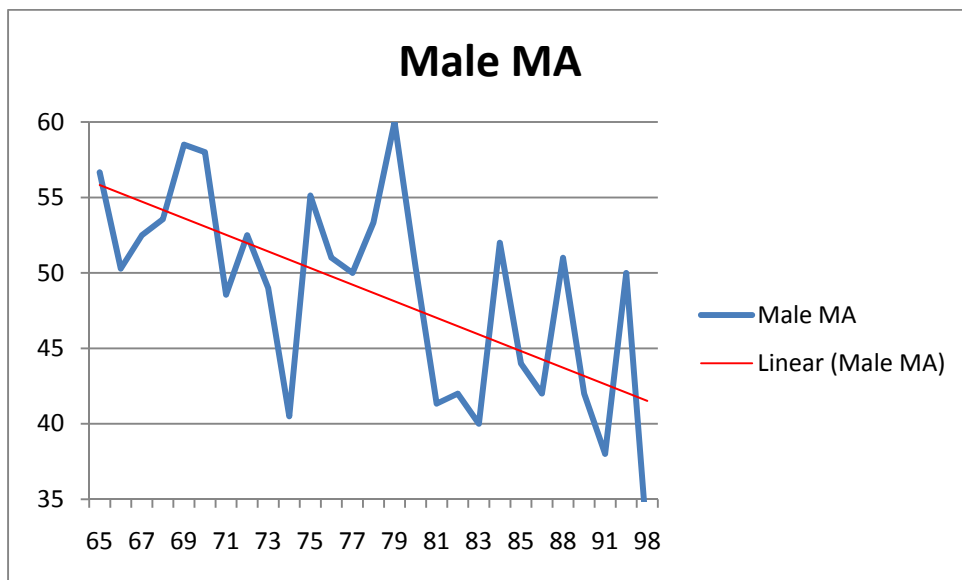


Figure 119: Rotation of the Head to the Right

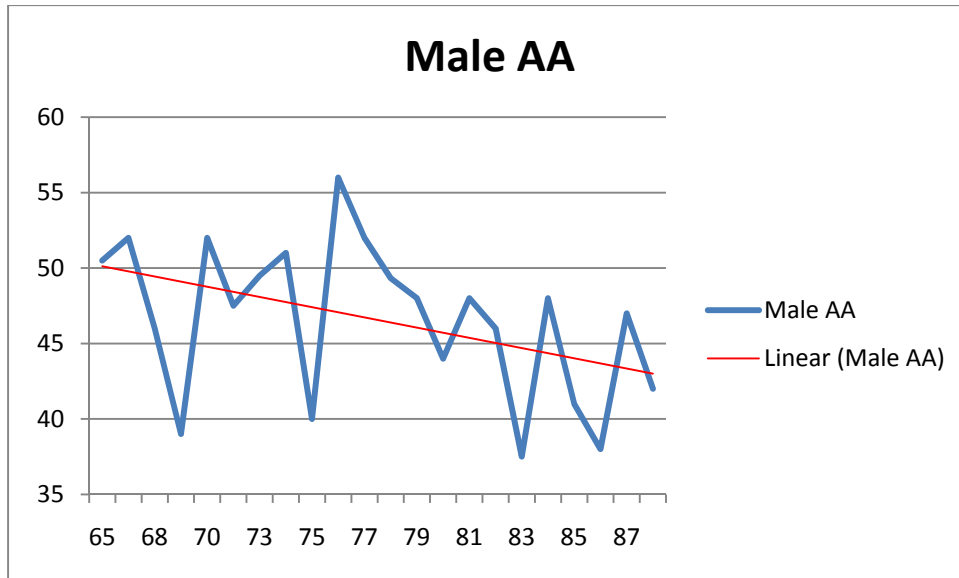


Figure 120: Rotation of the Head to the Right

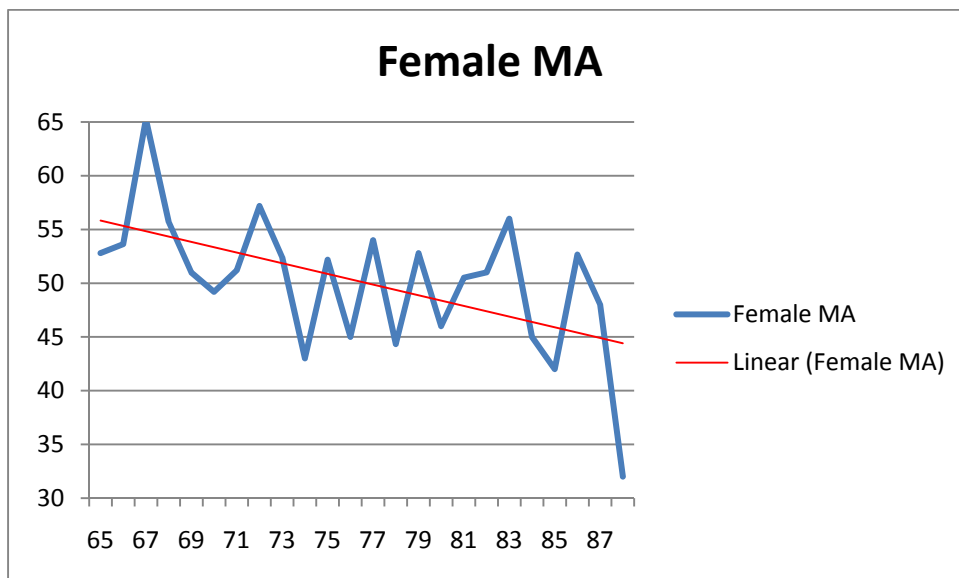


Figure 121: Rotation of the Head to the Right

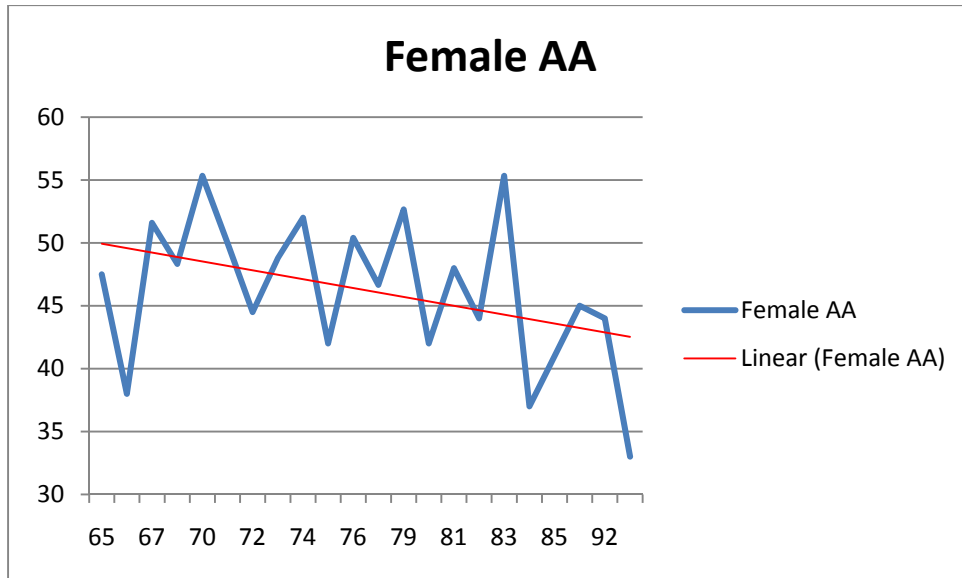


Figure 122: Rotation of the Head to the Right

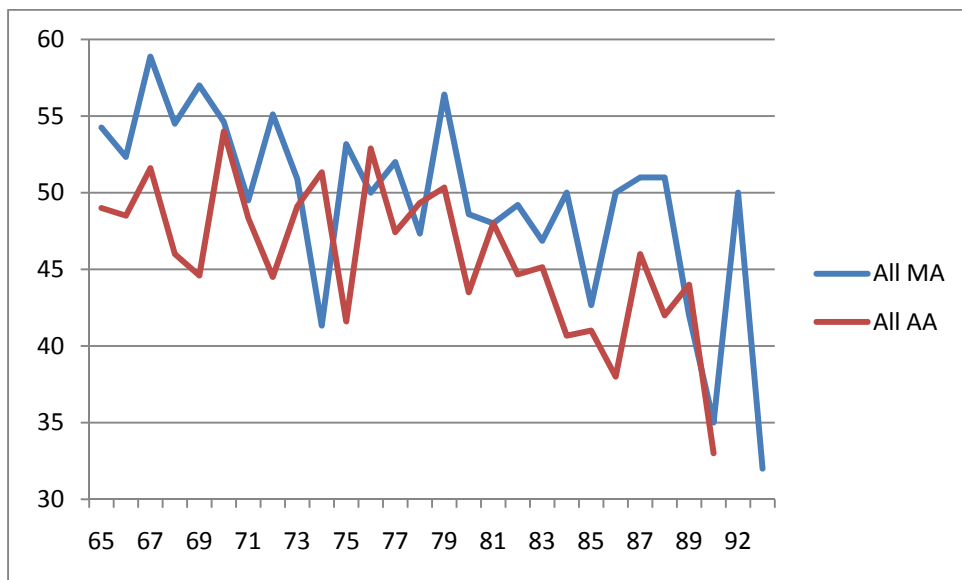


Figure 123: Rotation of the Head to the Right

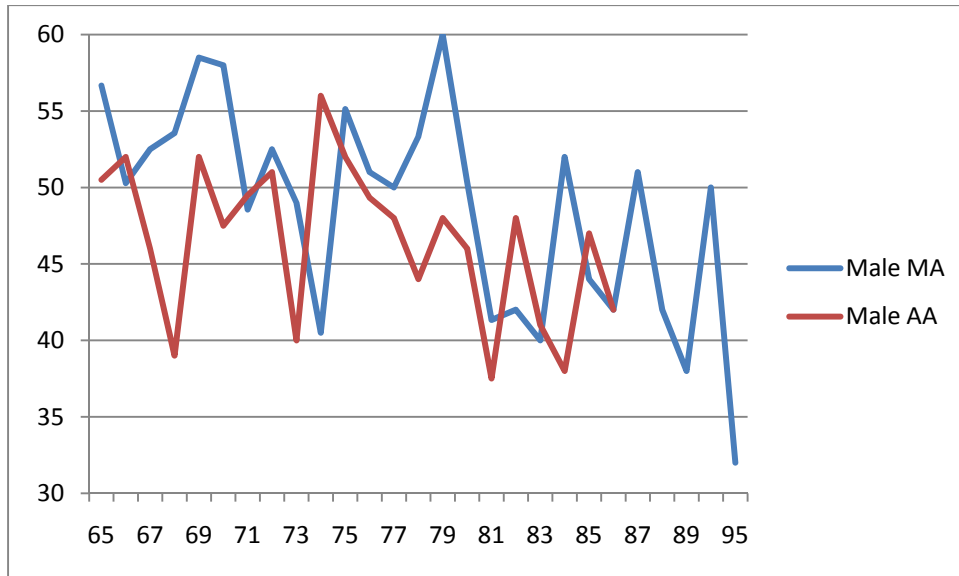


Figure 124: Rotation of the Head to the Right

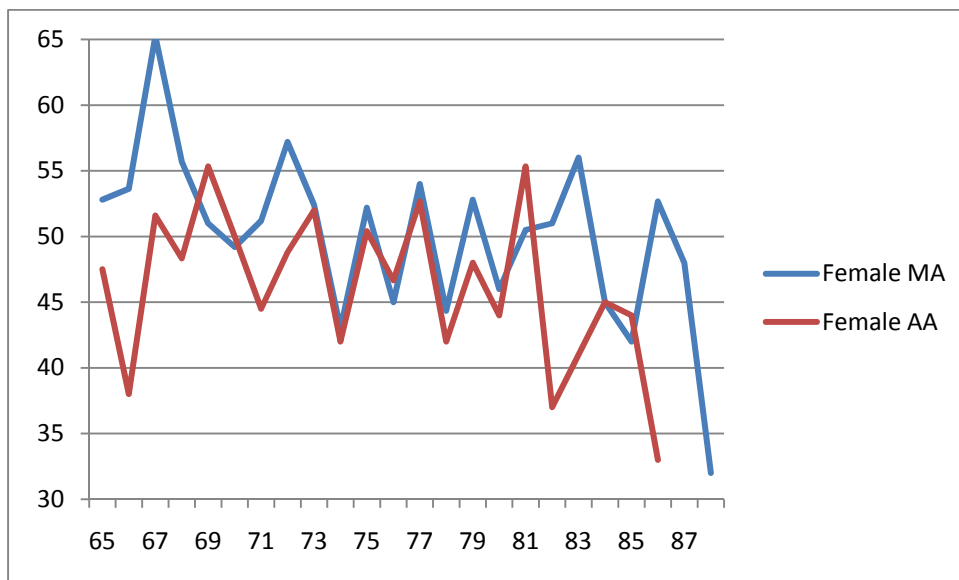


Figure 125: Rotation of the Head to the Right

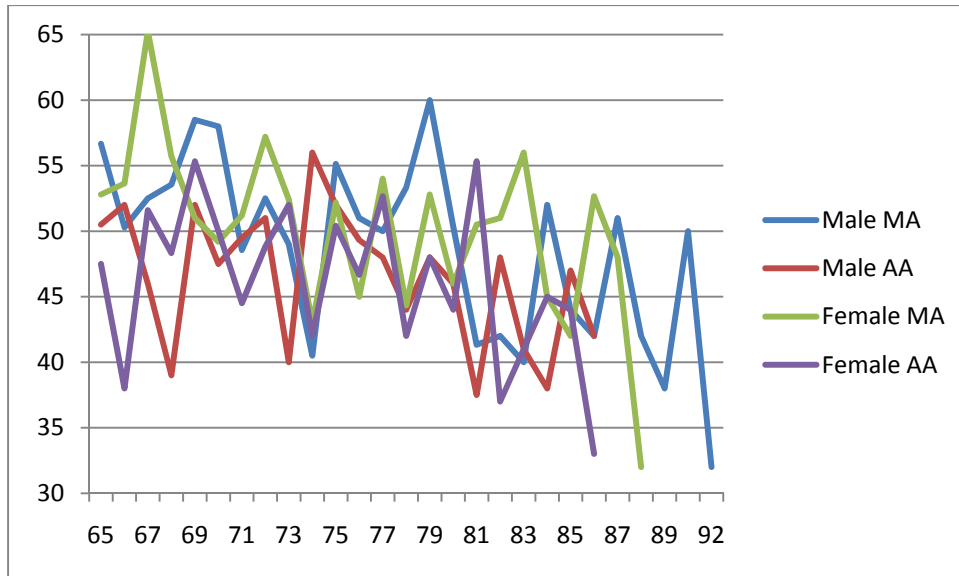


Figure 126: Rotation of the Head to the Right

Rotation of the Head to the Left

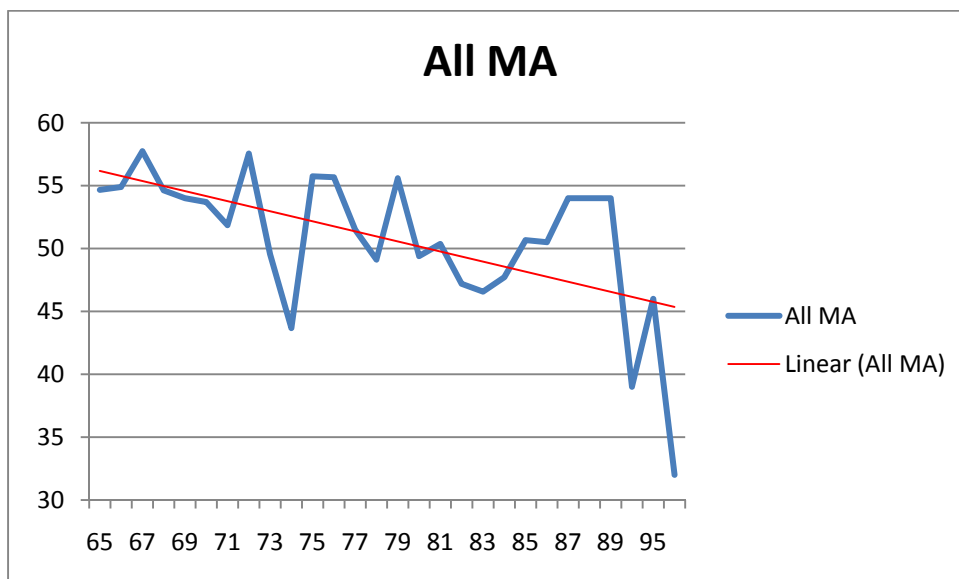


Figure 127: Rotation of the Head to the Left

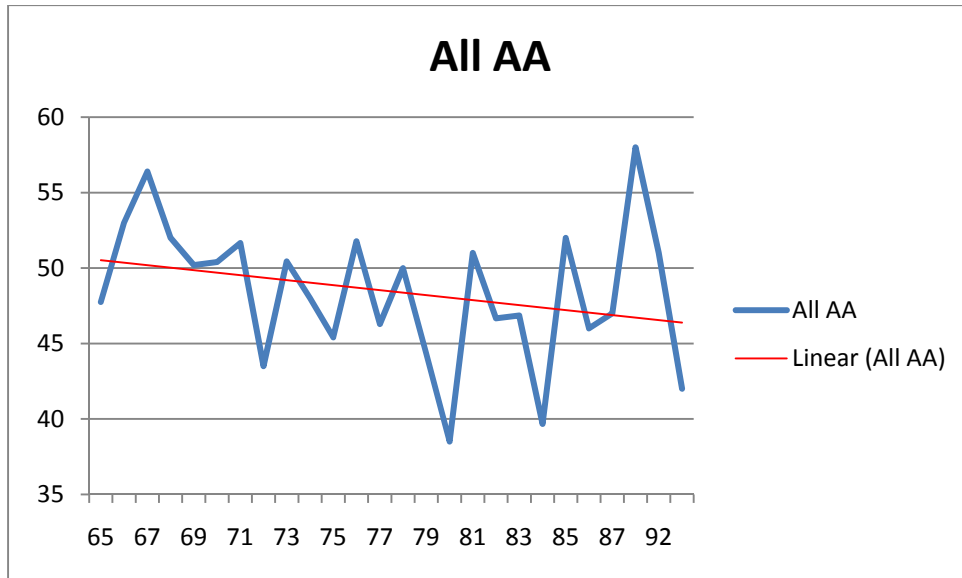


Figure 128: Rotation of the Head to the Left

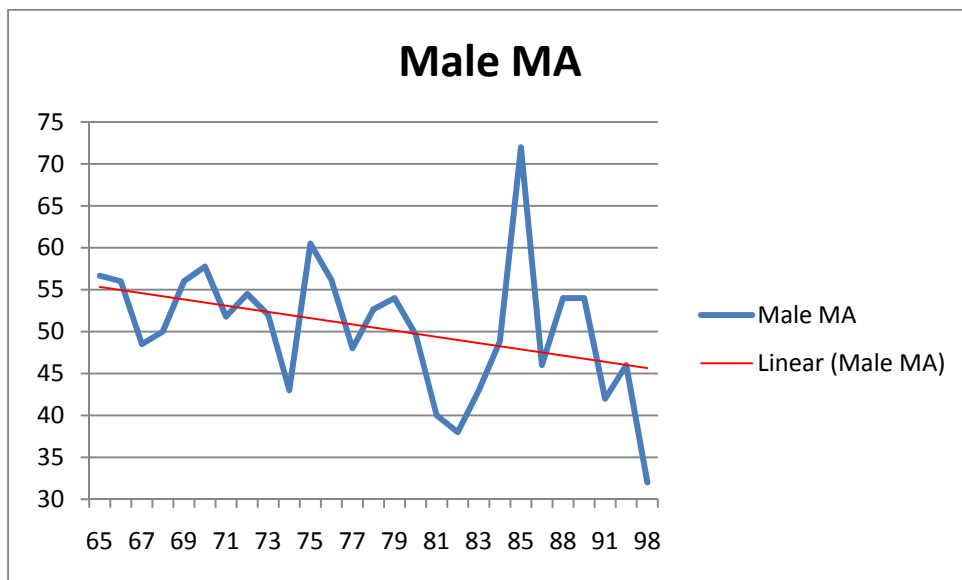


Figure 129: Rotation of the Head to the Left

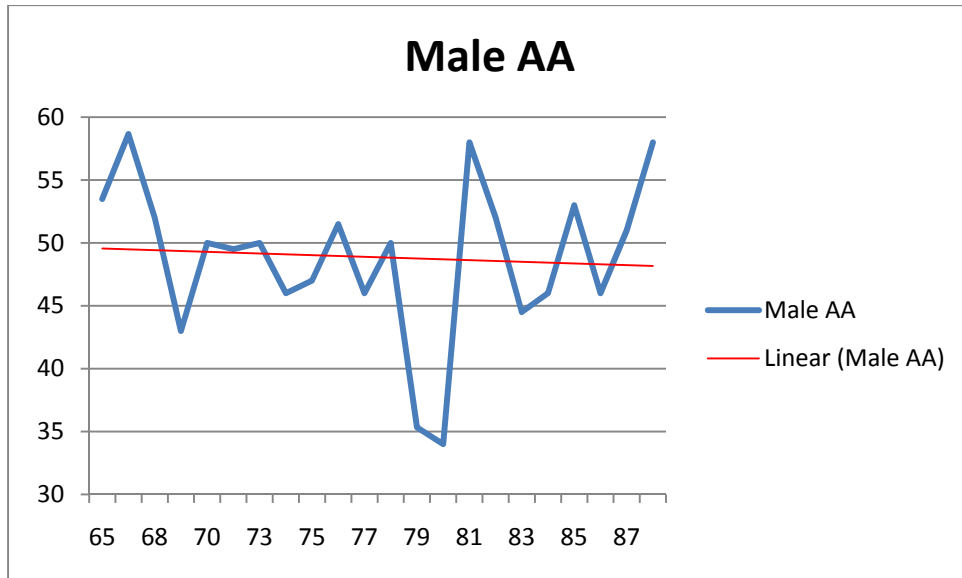


Figure 130: Rotation of the Head to the Left

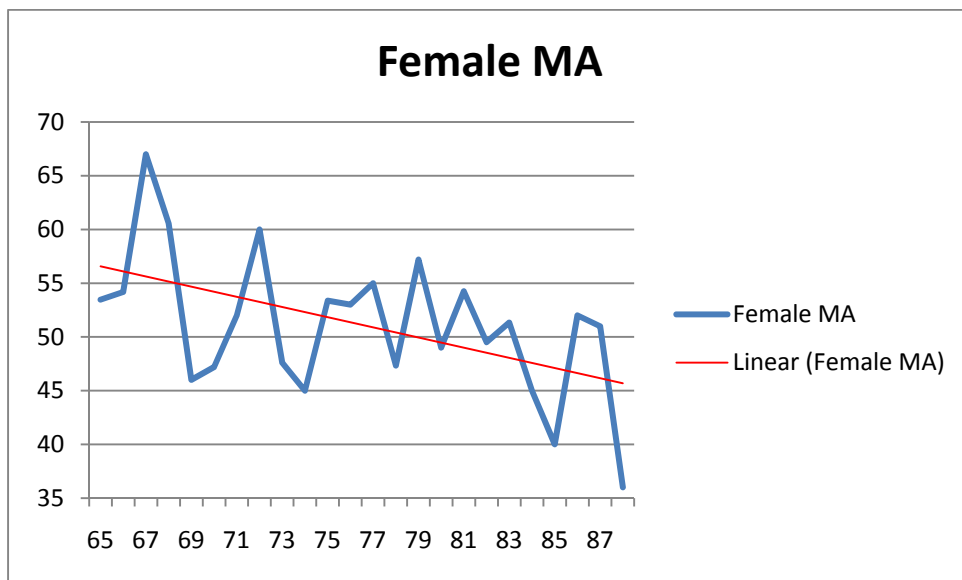


Figure 131: Rotation of the Head to the Left

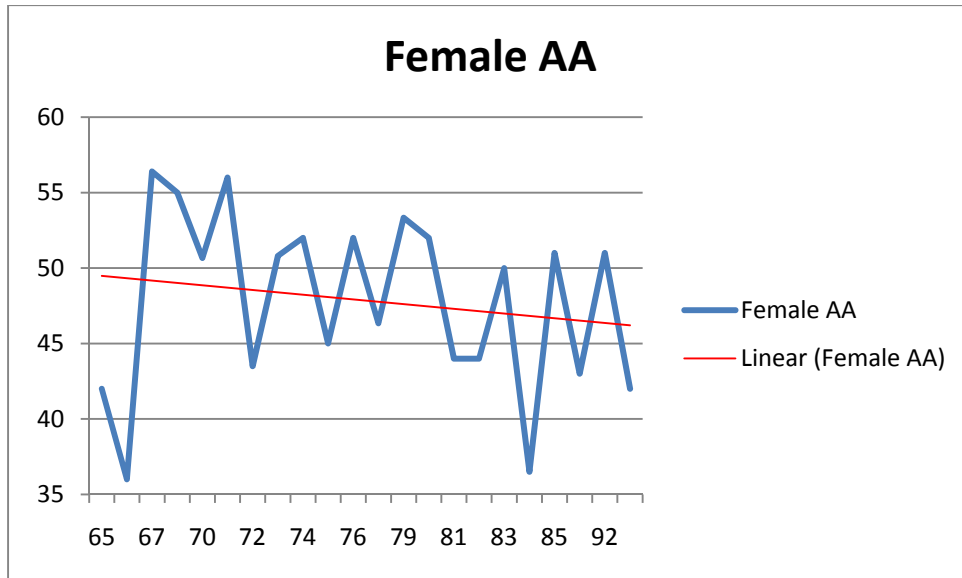


Figure 132: Rotation of the Head to the Left

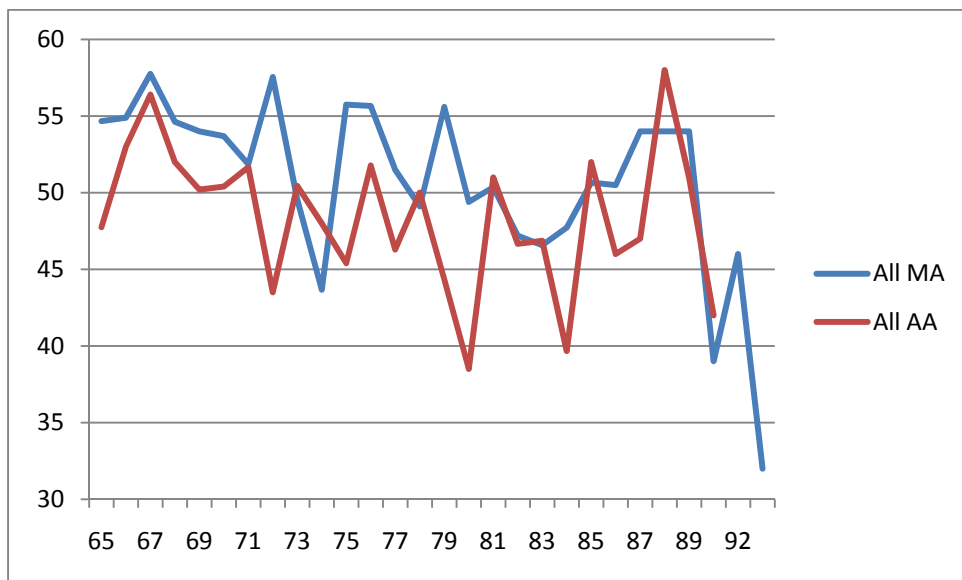


Figure 133: Rotation of the Head to the Left

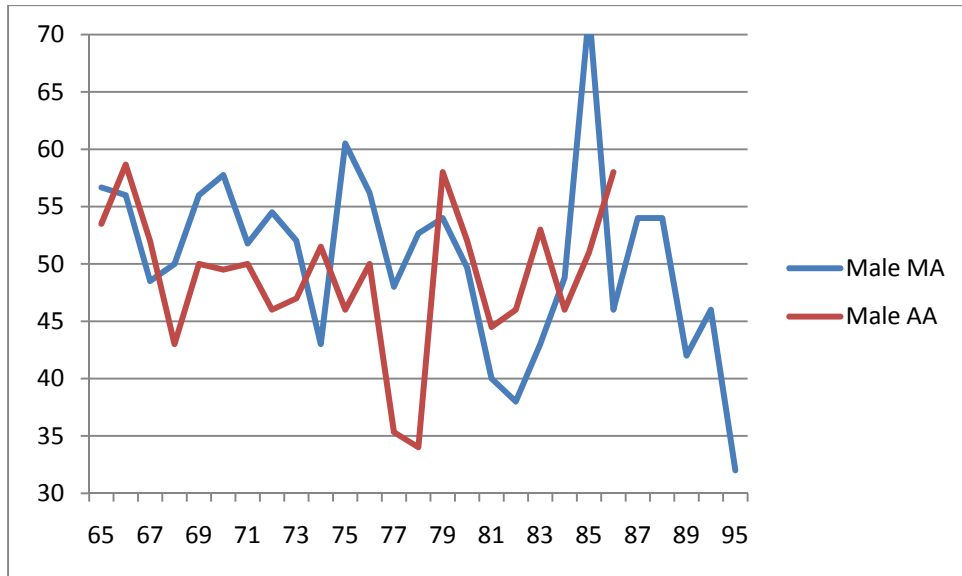


Figure 134: Rotation of the Head to the Left

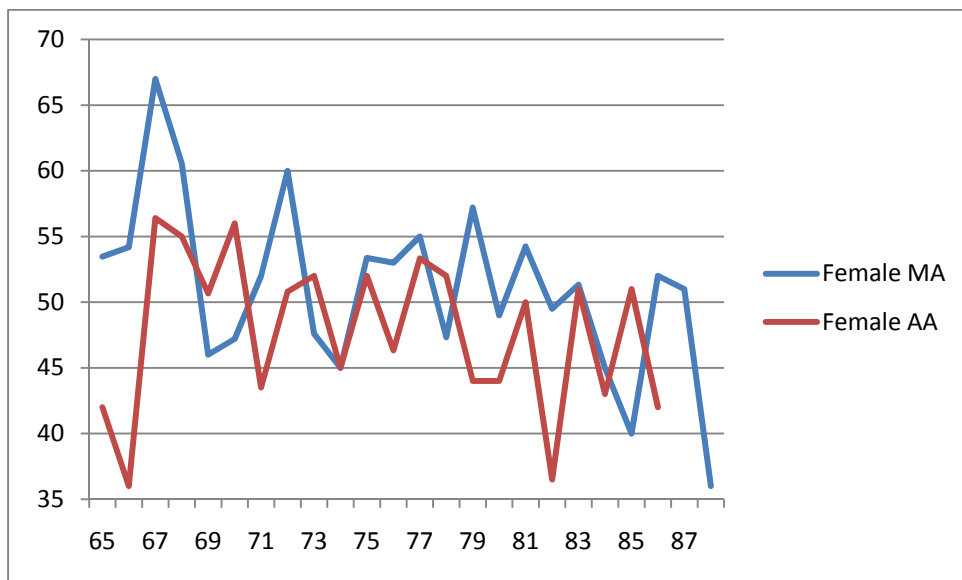


Figure 135: Rotation of the Head to the Left

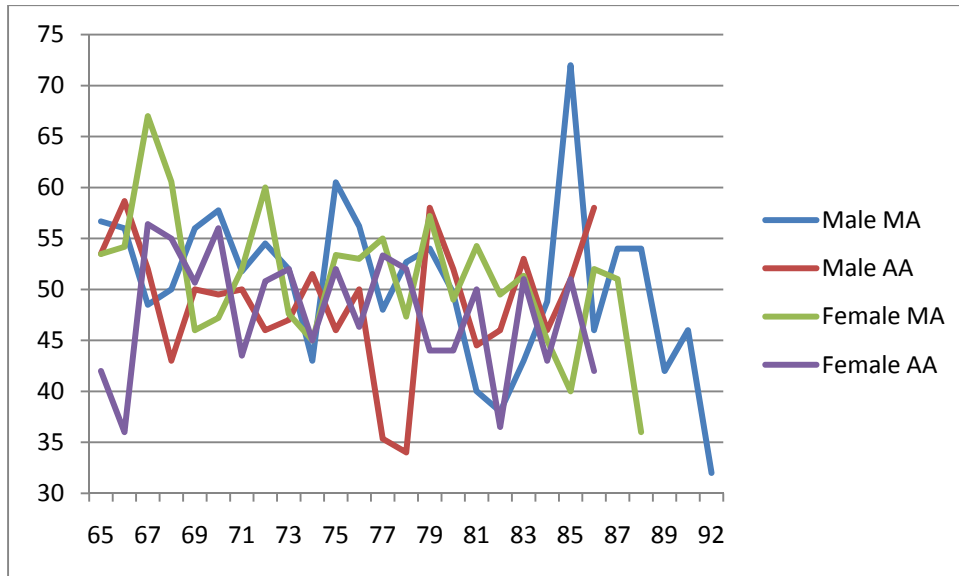


Figure 136: Rotation of the Head to the Left

Flexion of Head

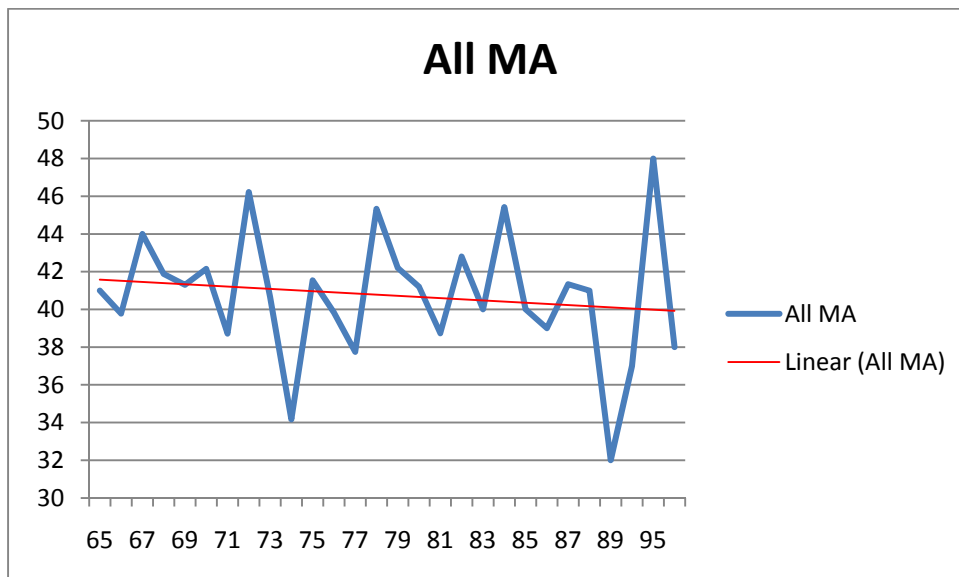


Figure 137: Flexion of Head

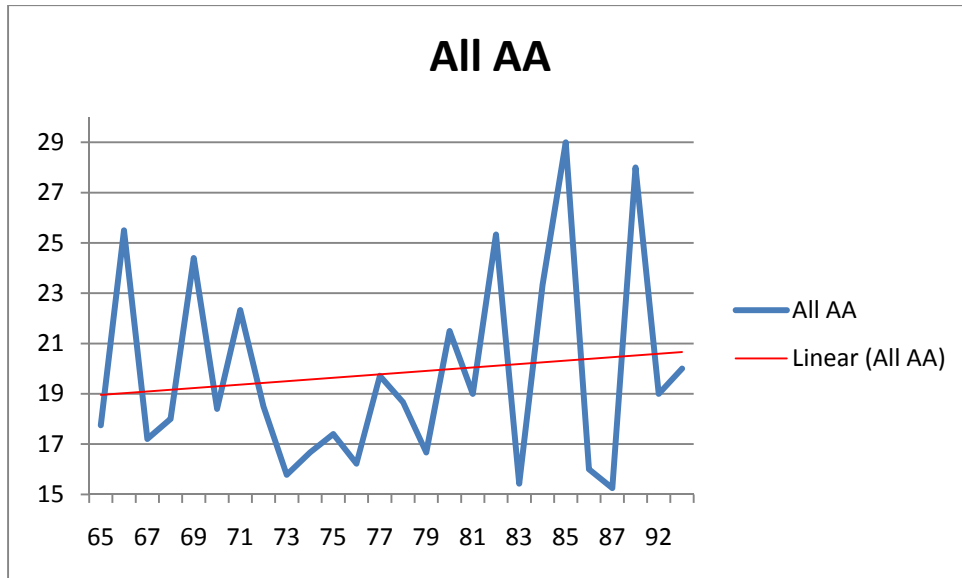


Figure 138: Flexion of Head

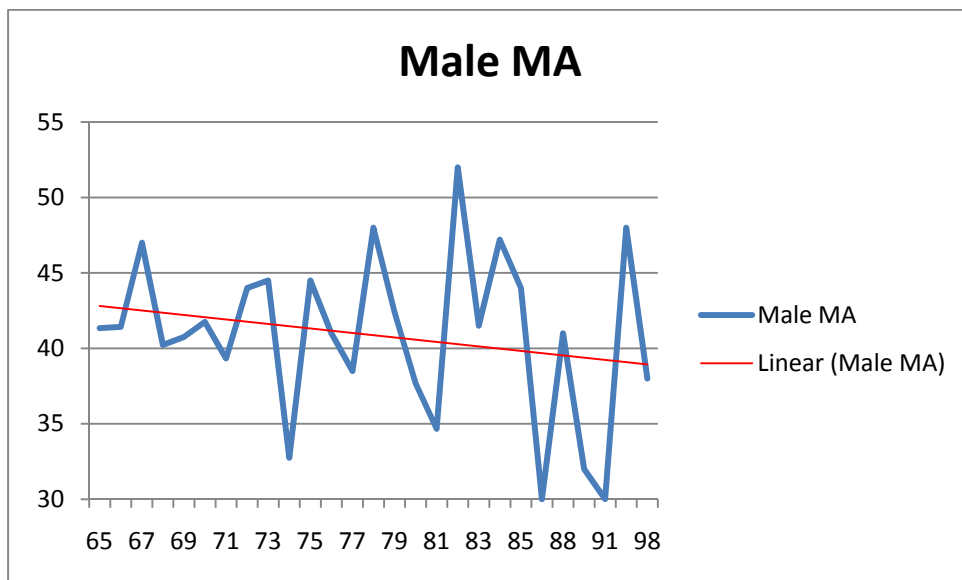


Figure 139: Flexion of Head

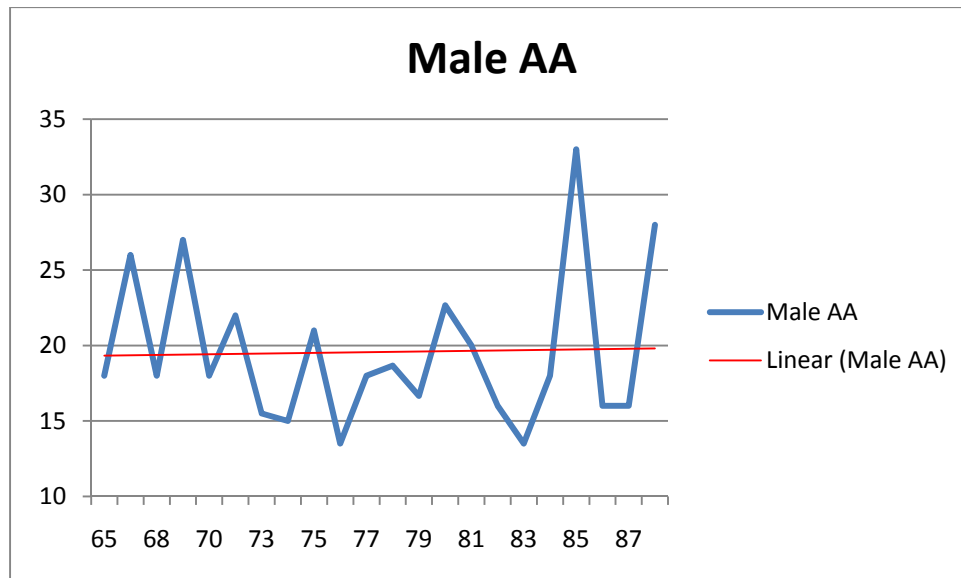


Figure 140: Flexion of Head

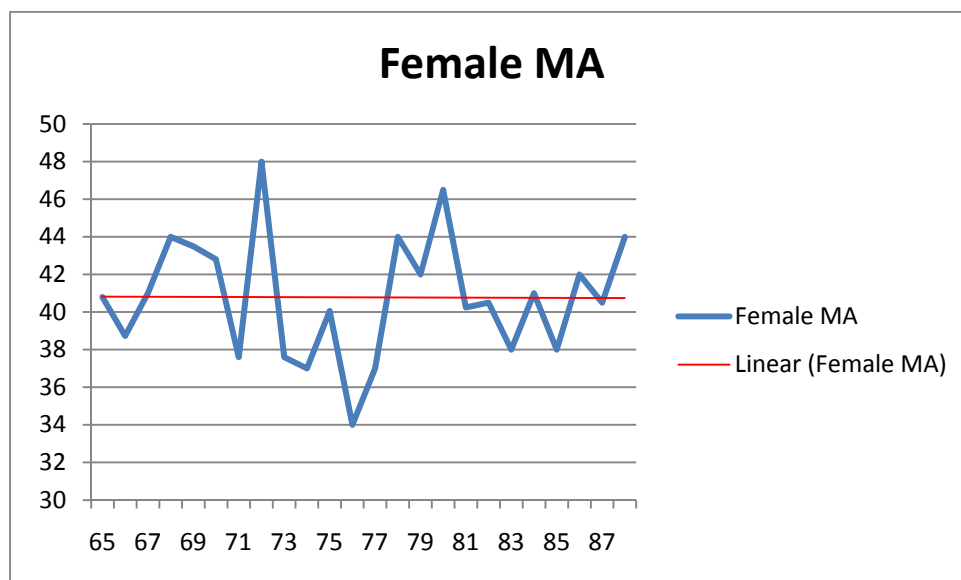


Figure 141: Flexion of Head

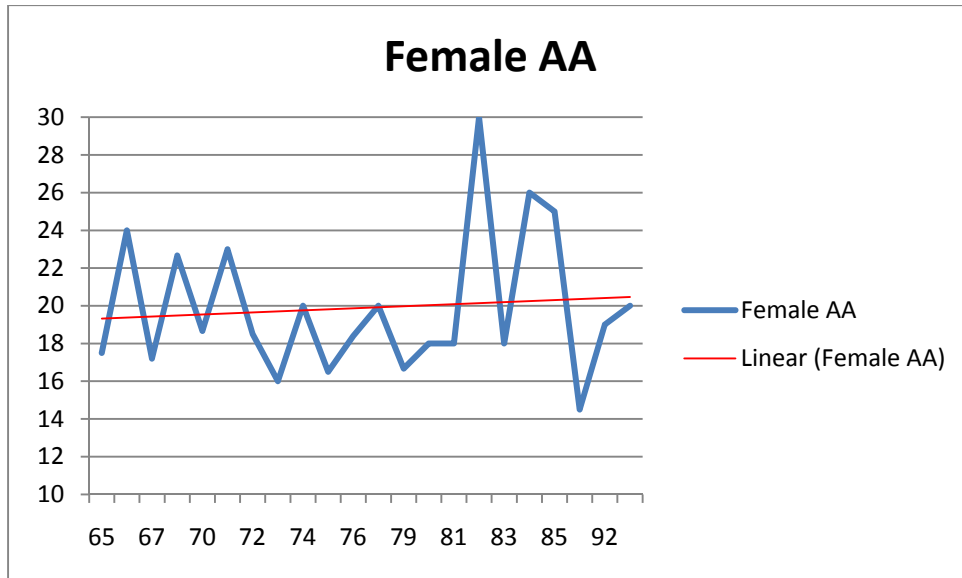


Figure 142: Flexion of Head

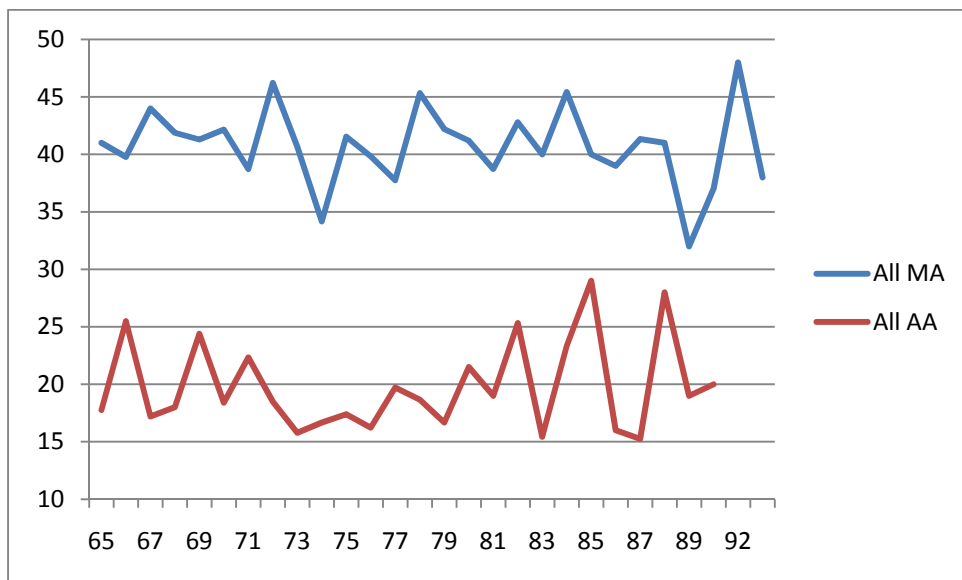


Figure 143: Flexion of Head

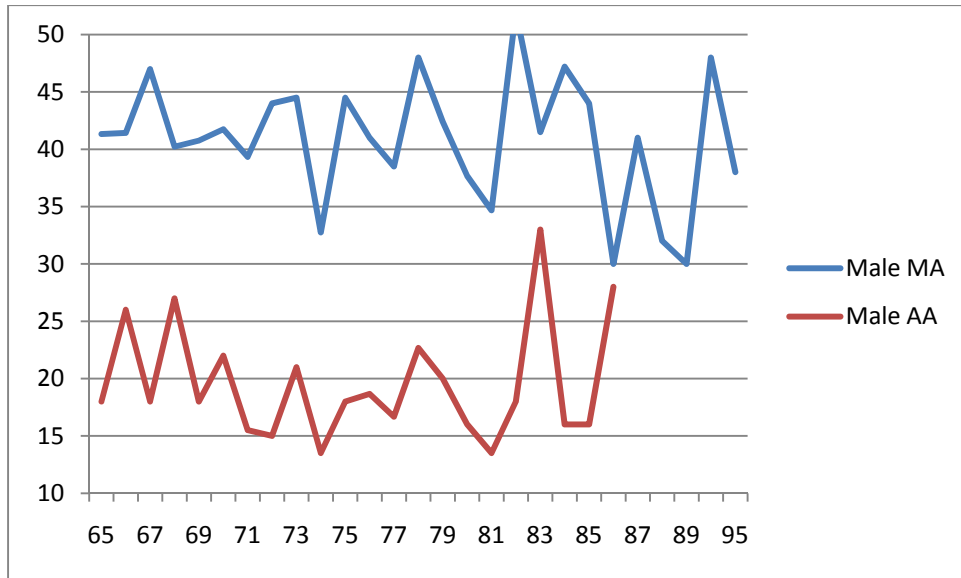


Figure 144: Flexion of Head

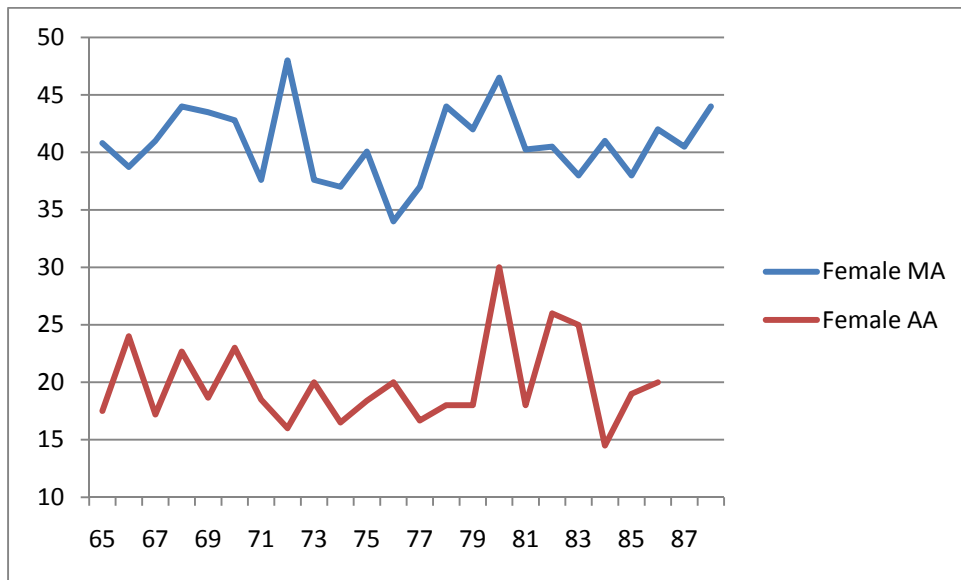


Figure 145: Flexion of Head

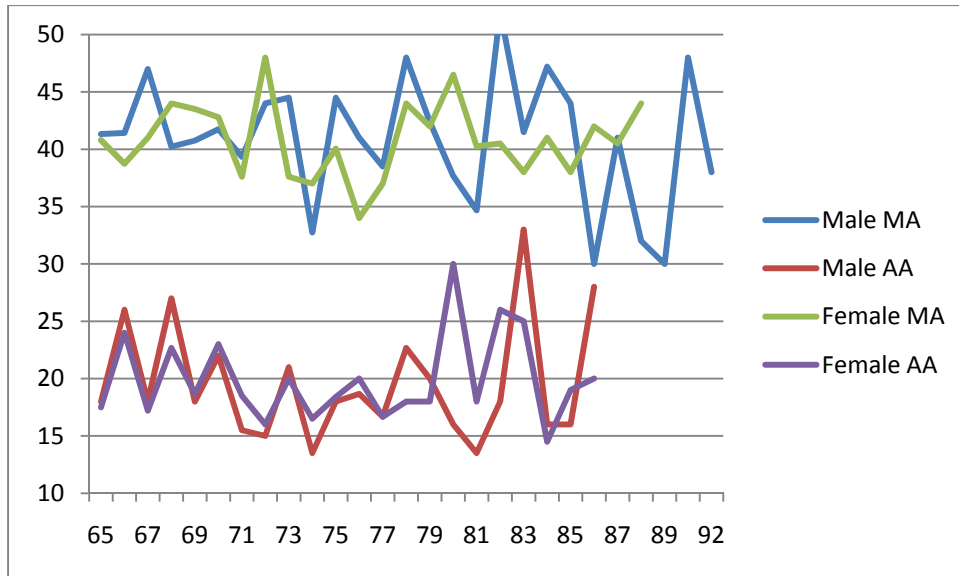


Figure 146: Flexion of Head

Extension of Head

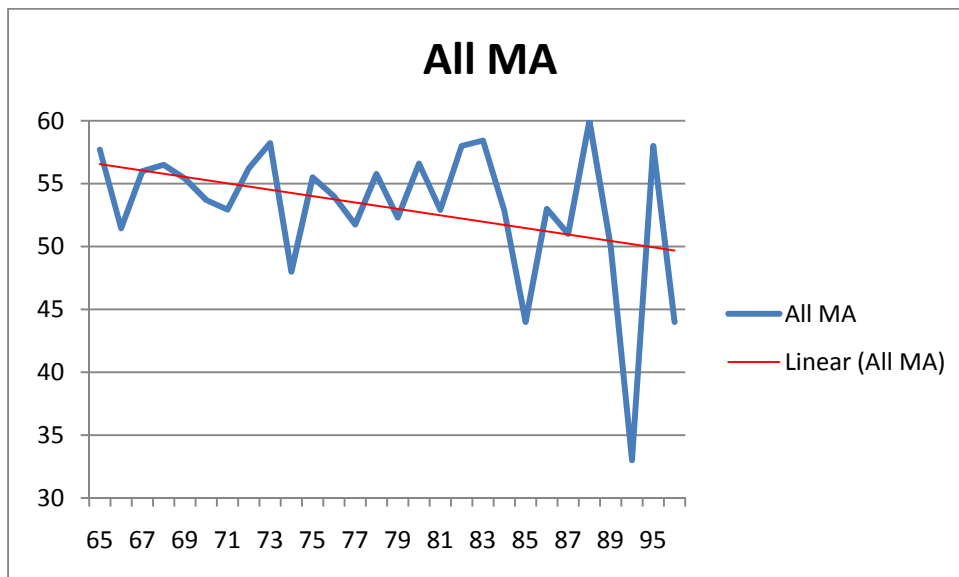


Figure 147: Extension of Head

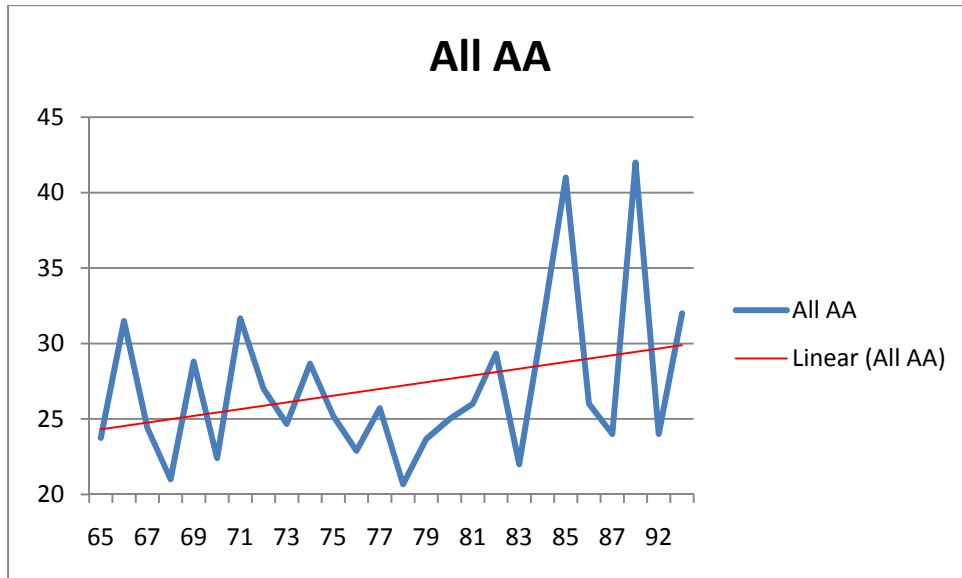


Figure 148: Extension of Head

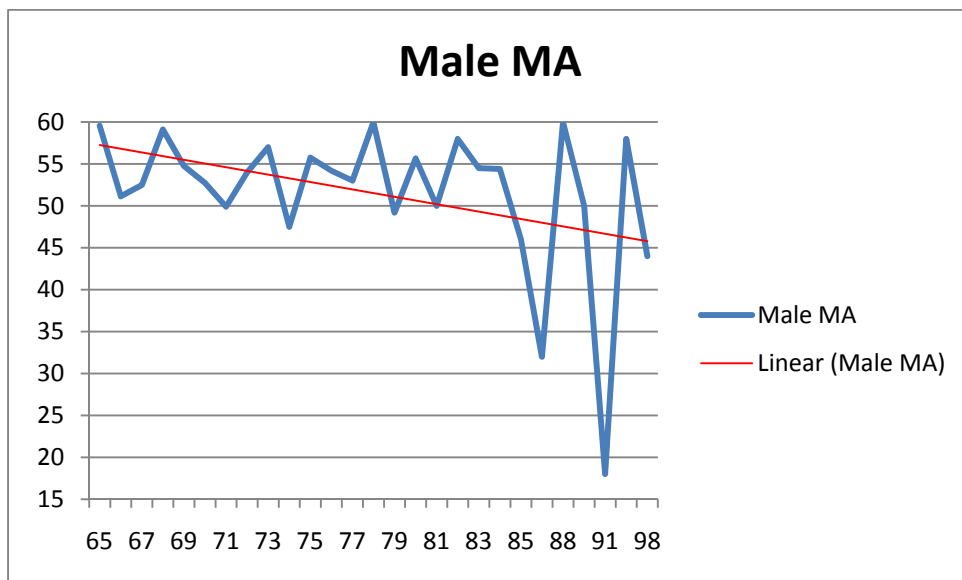


Figure 149: Extension of Head

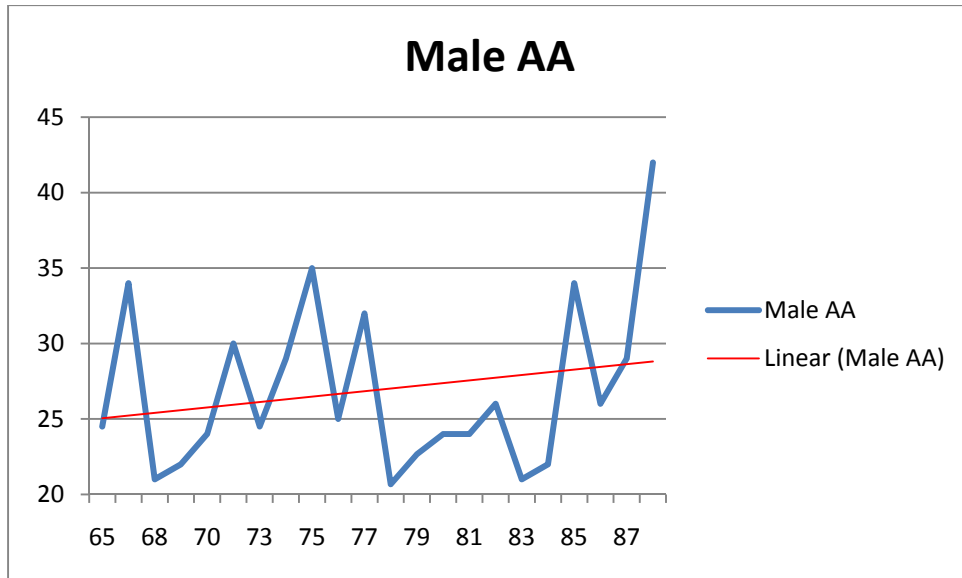


Figure 150: Extension of Head

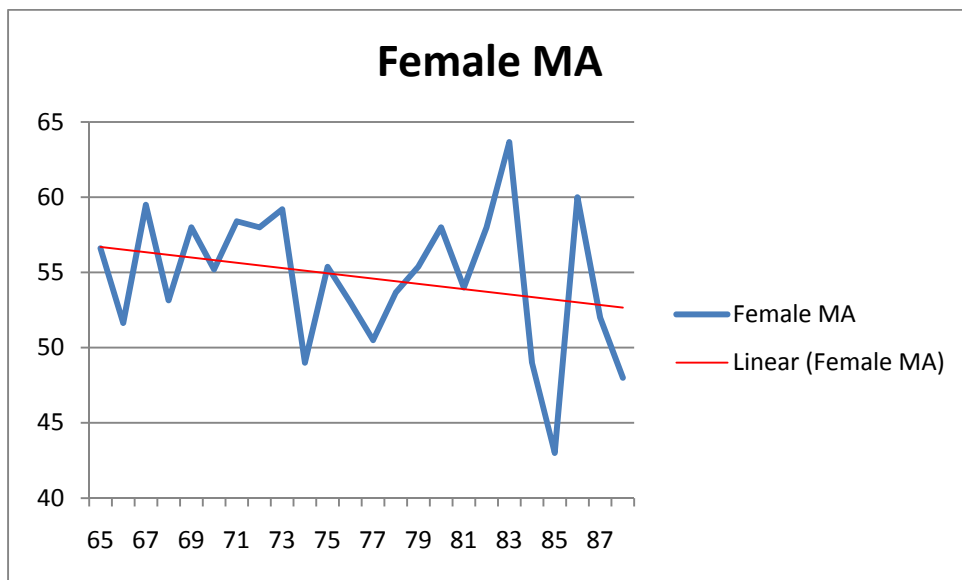


Figure 151: Extension of Head

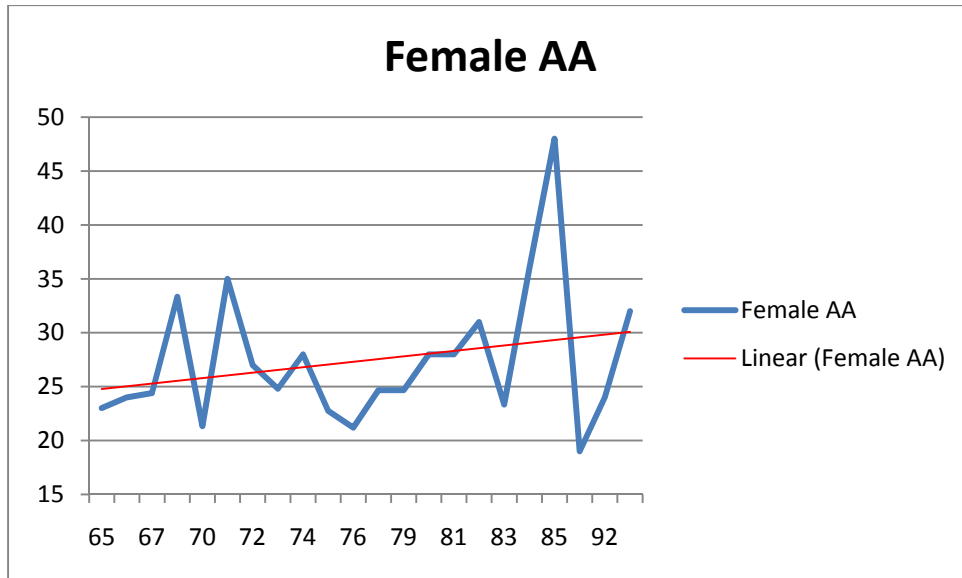


Figure 152: Extension of Head

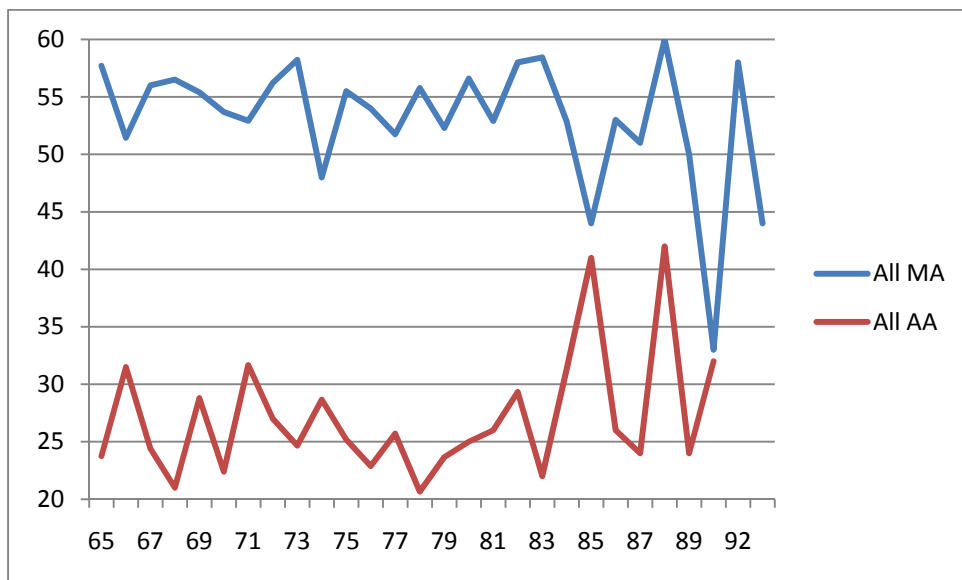


Figure 153: Extension of Head

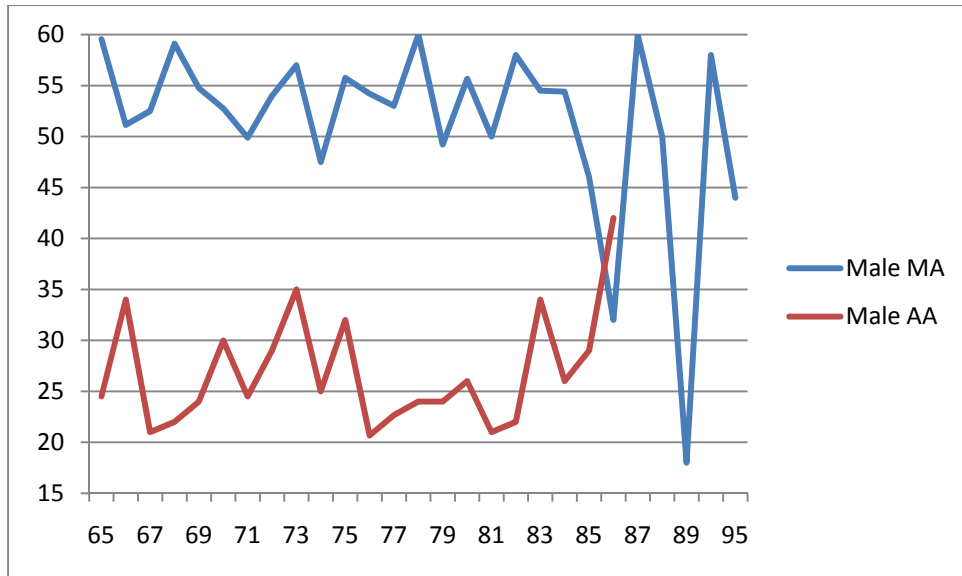


Figure 154: Extension of Head

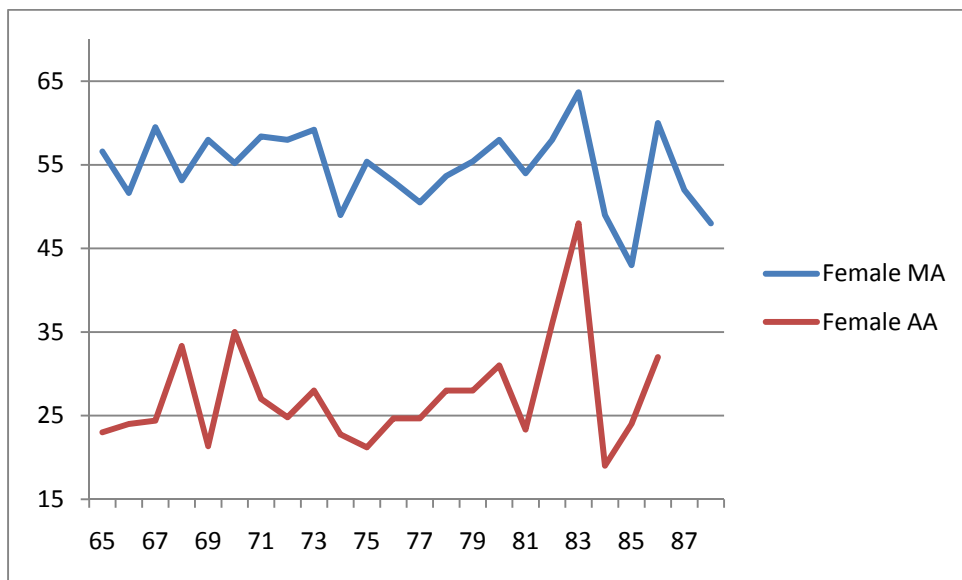


Figure 155: Extension of Head

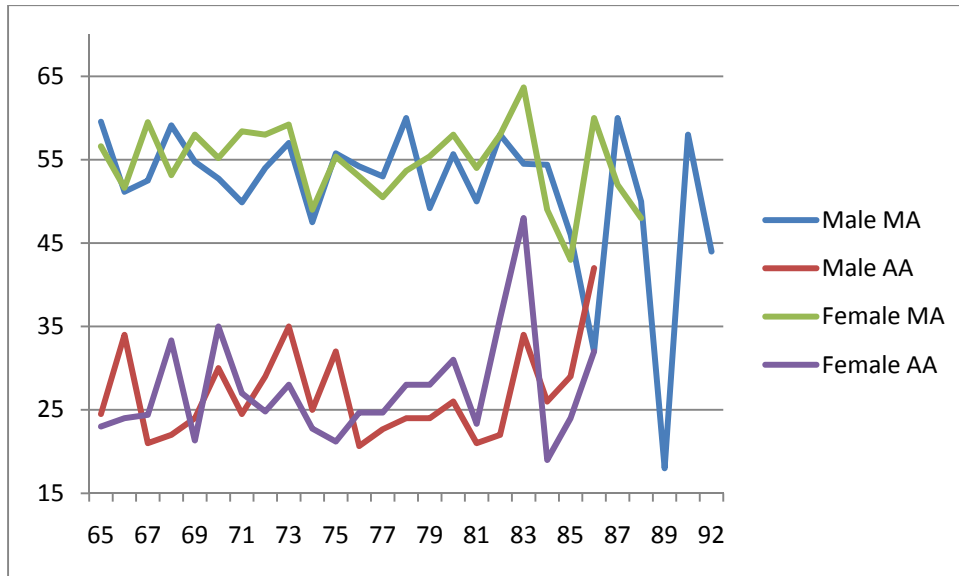


Figure 156: Extension of Head

Lateral Rotation of the Shoulder

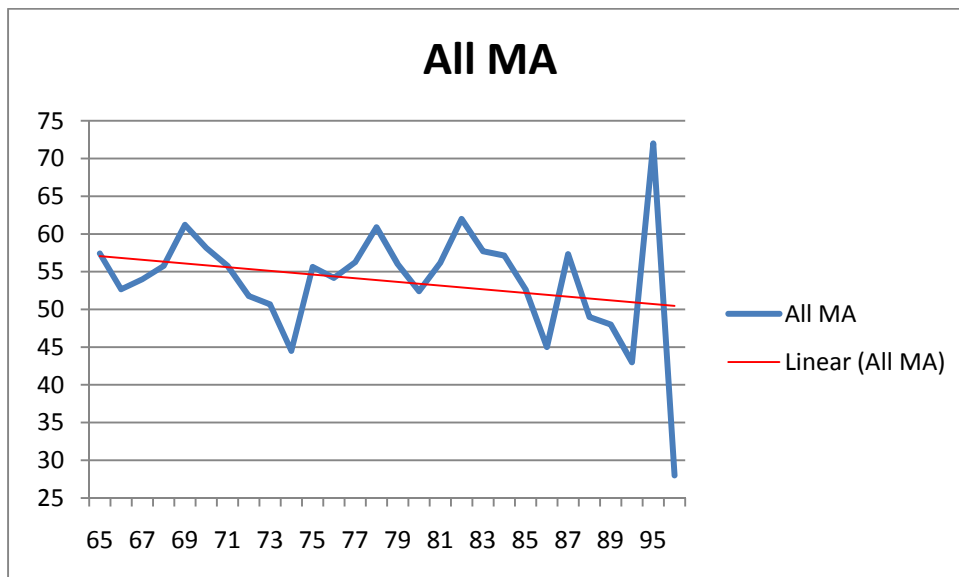


Figure 157: Lateral Rotation of the Shoulder

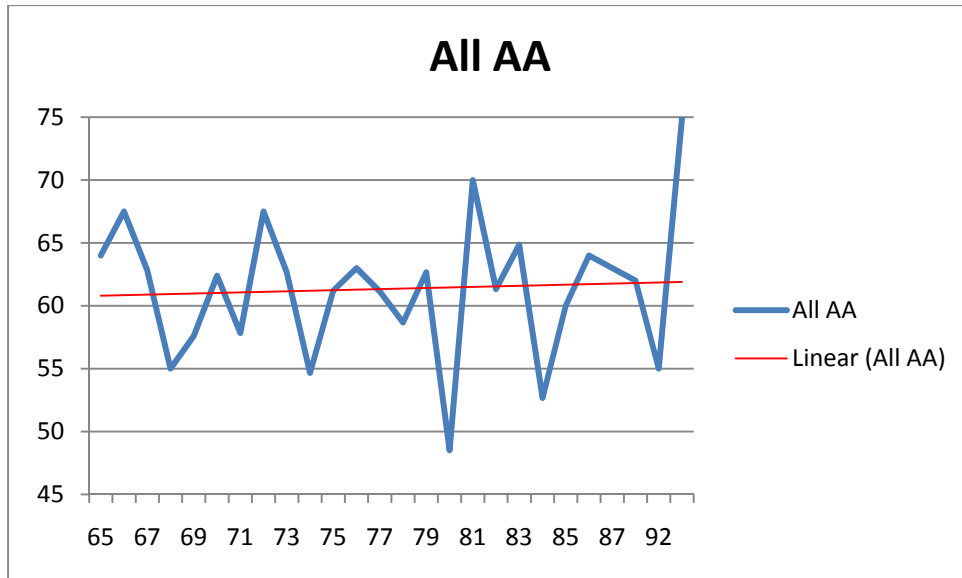


Figure 158: Lateral Rotation of the Shoulder

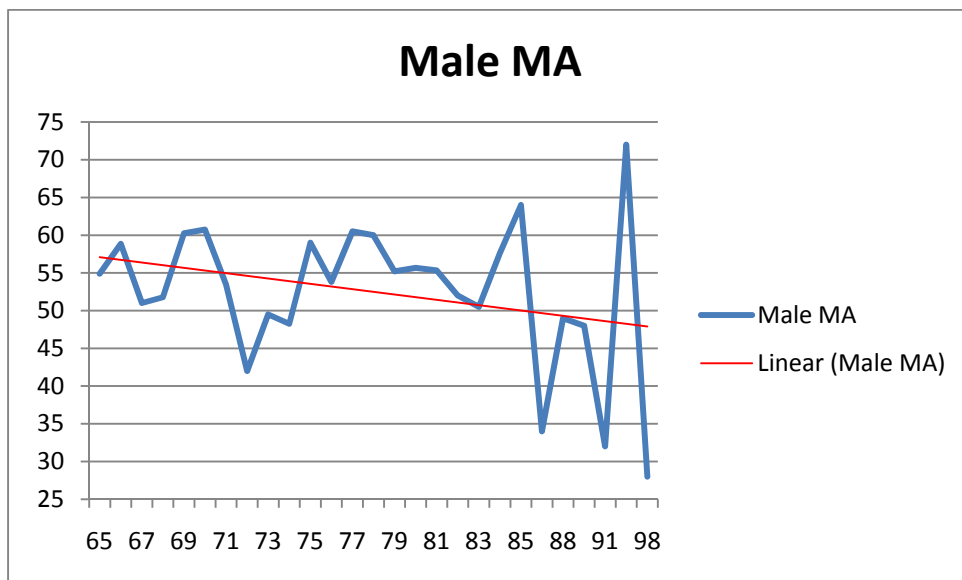


Figure 159: Lateral Rotation of the Shoulder

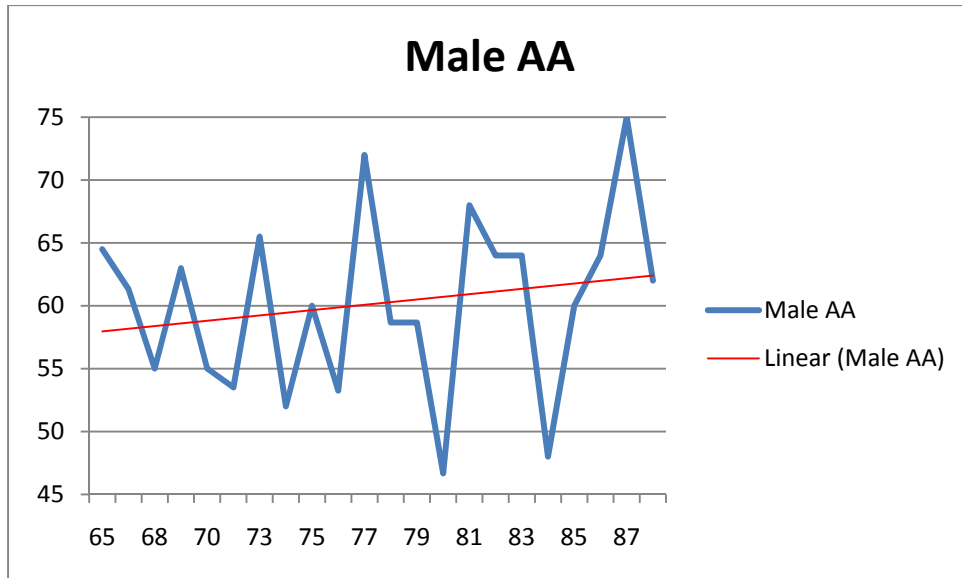


Figure 160: Lateral Rotation of the Shoulder

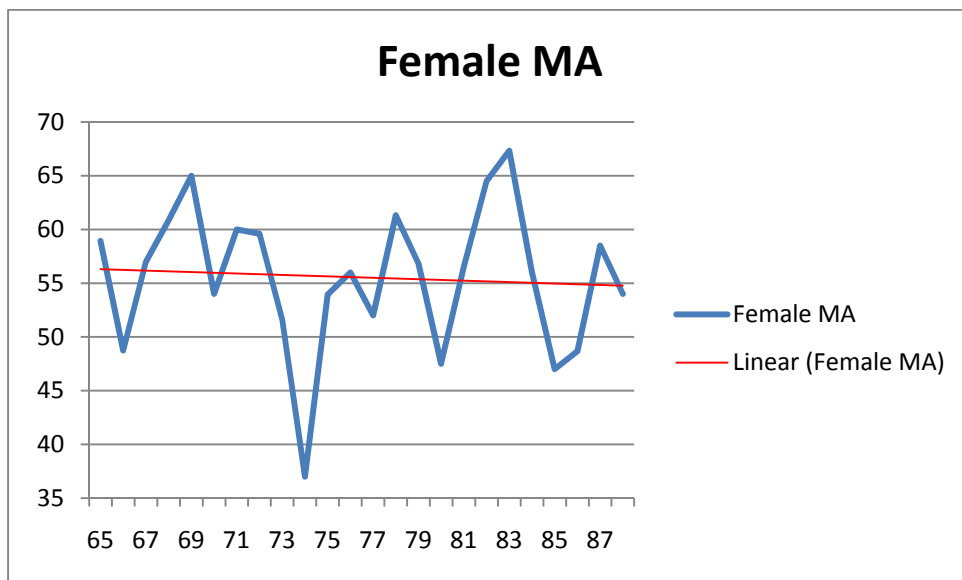


Figure 161: Lateral Rotation of the Shoulder

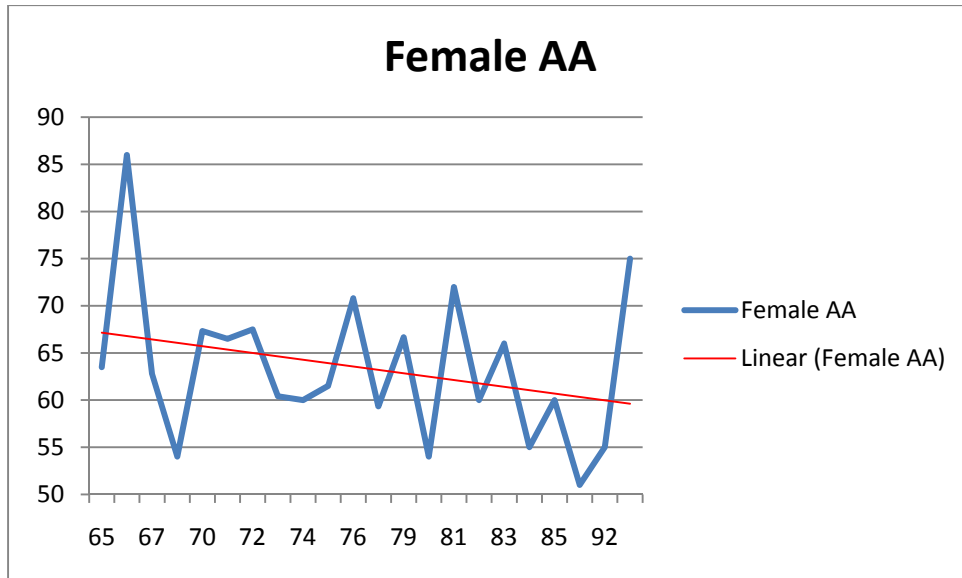


Figure 162: Lateral Rotation of the Shoulder

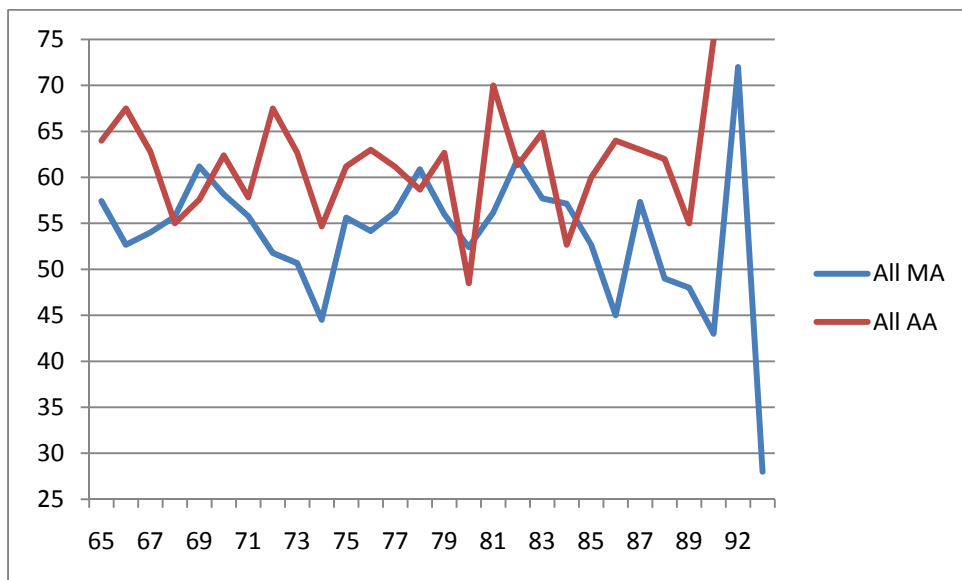


Figure 163: Lateral Rotation of the Shoulder

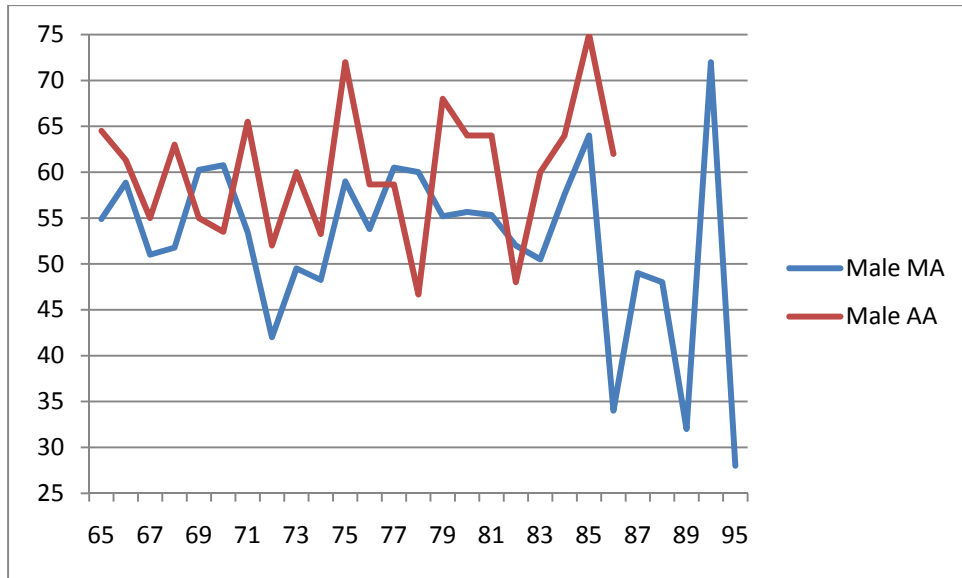


Figure 164: Lateral Rotation of the Shoulder

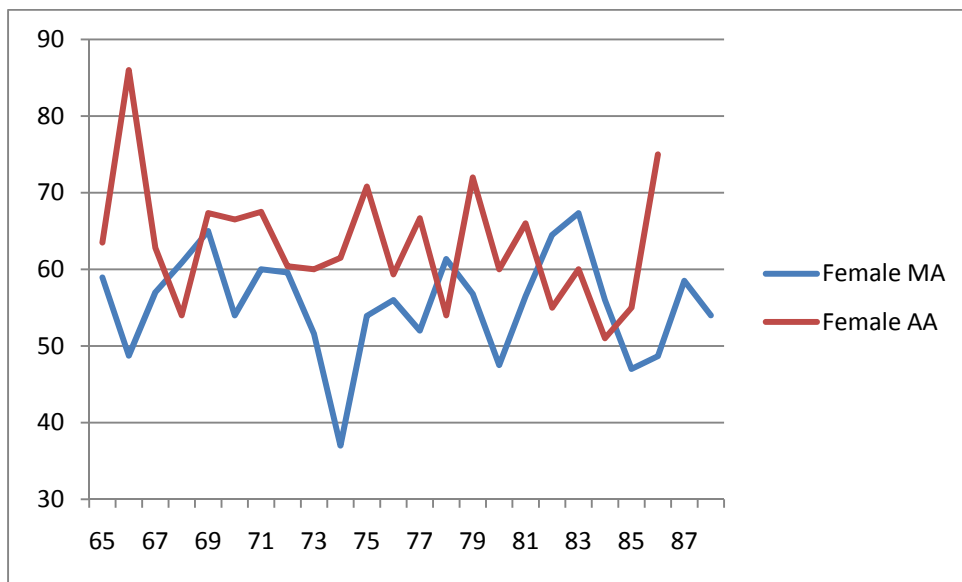


Figure 165: Lateral Rotation of the Shoulder

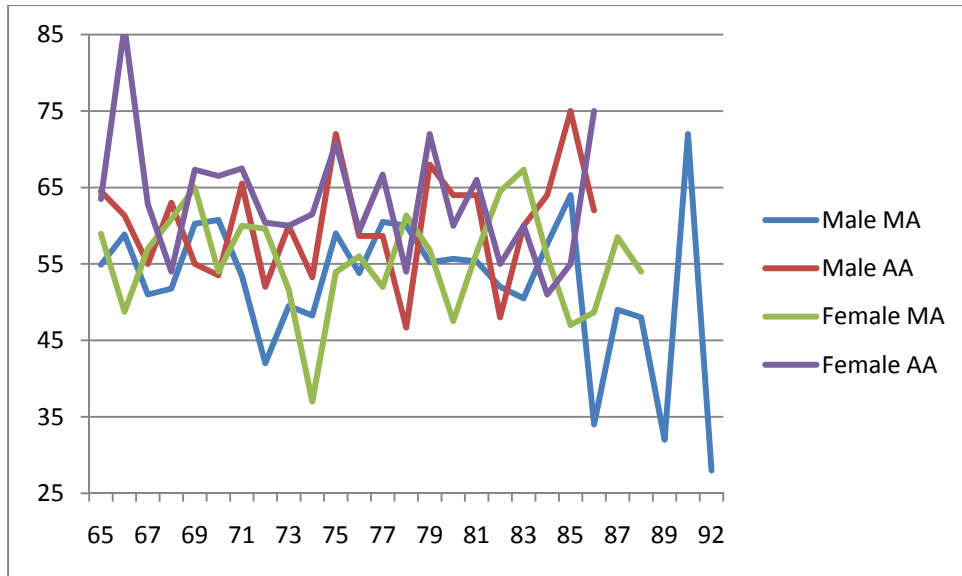


Figure 166: Lateral Rotation of the Shoulder

Medial Rotation of the Shoulder

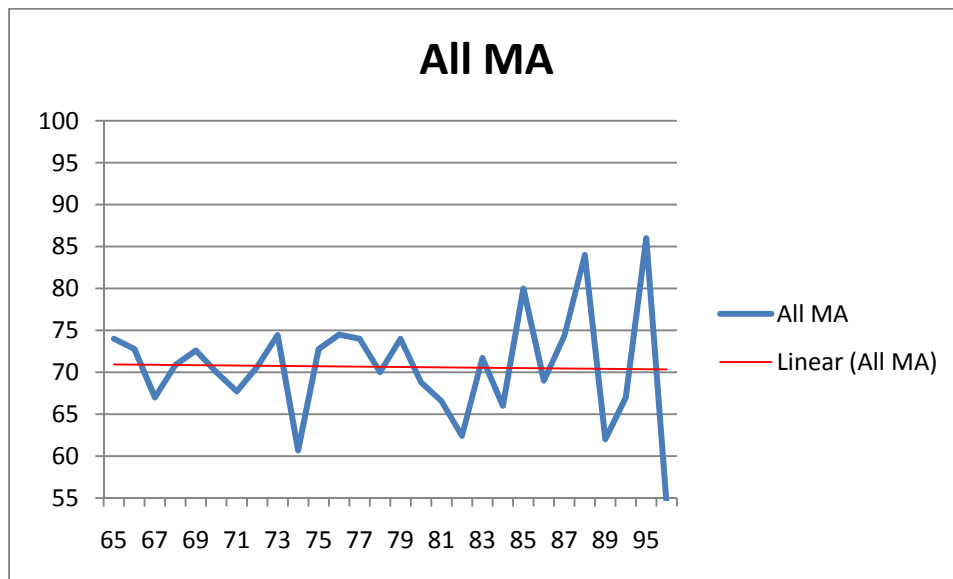


Figure 167: Medial Rotation of the Shoulder

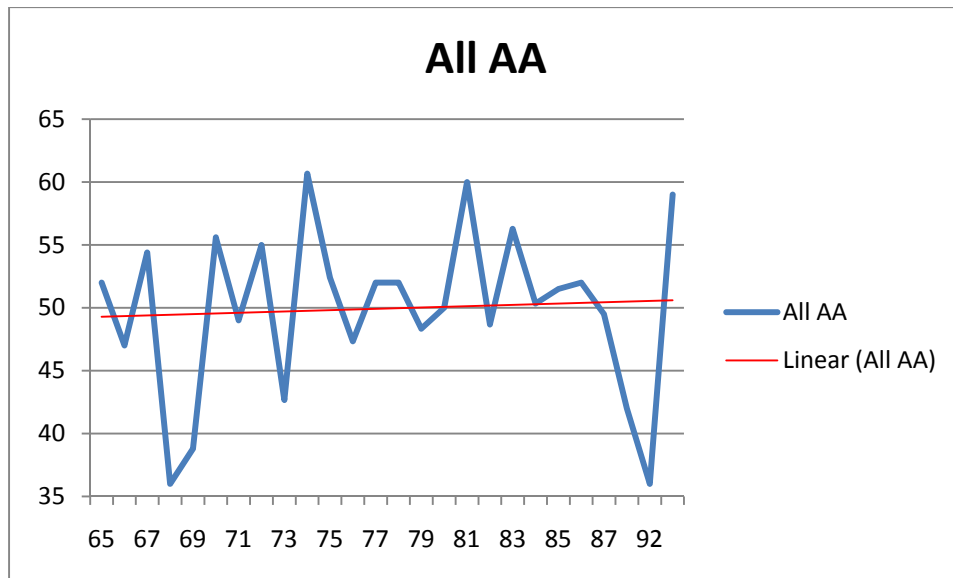


Figure 168: Medial Rotation of the Shoulder

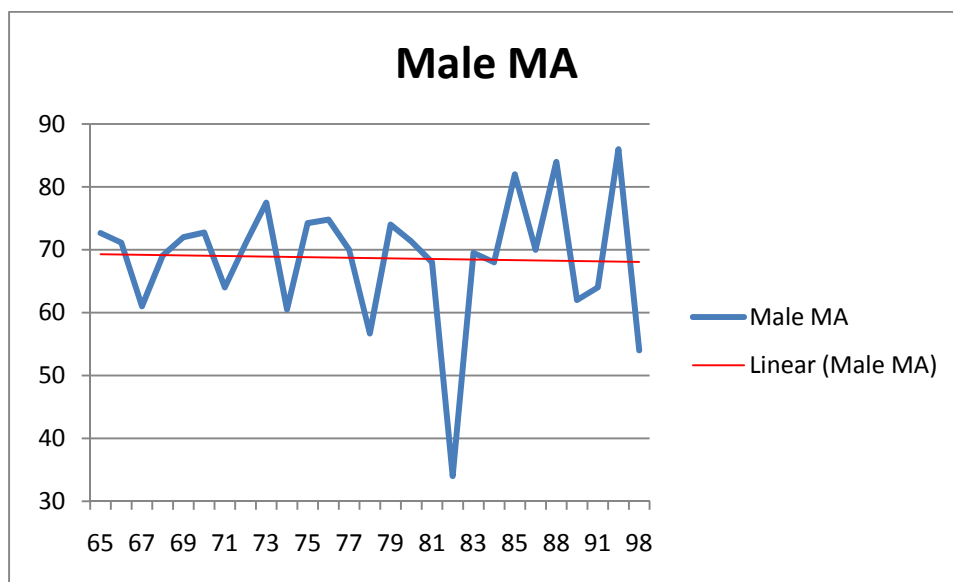


Figure 169: Medial Rotation of the Shoulder

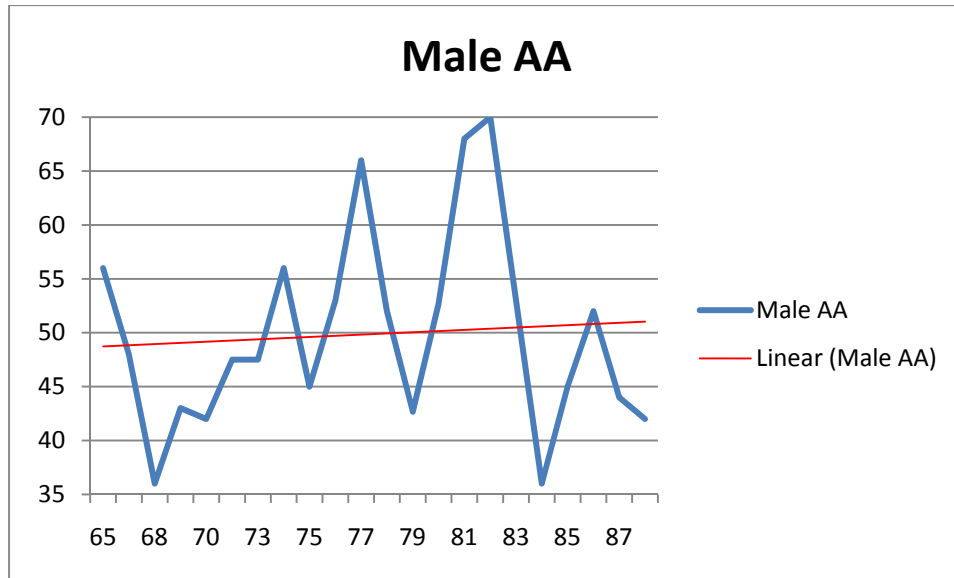


Figure 170: Medial Rotation of the Shoulder

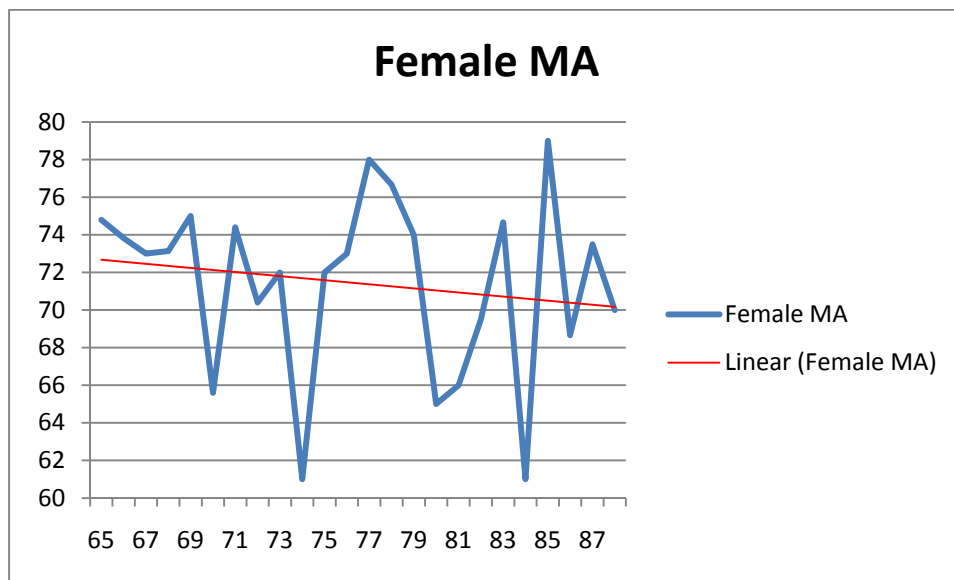


Figure 171: Medial Rotation of the Shoulder

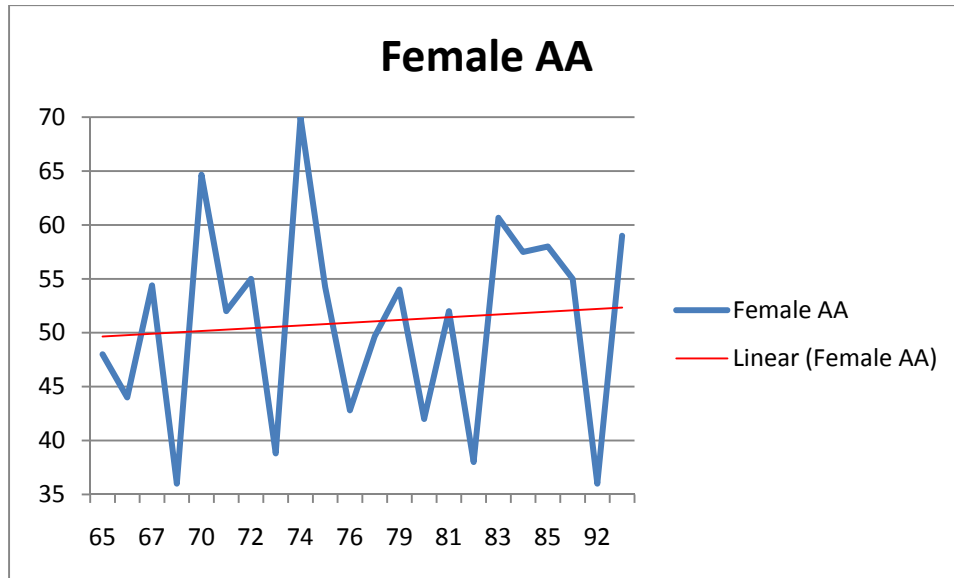


Figure 172: Medial Rotation of the Shoulder

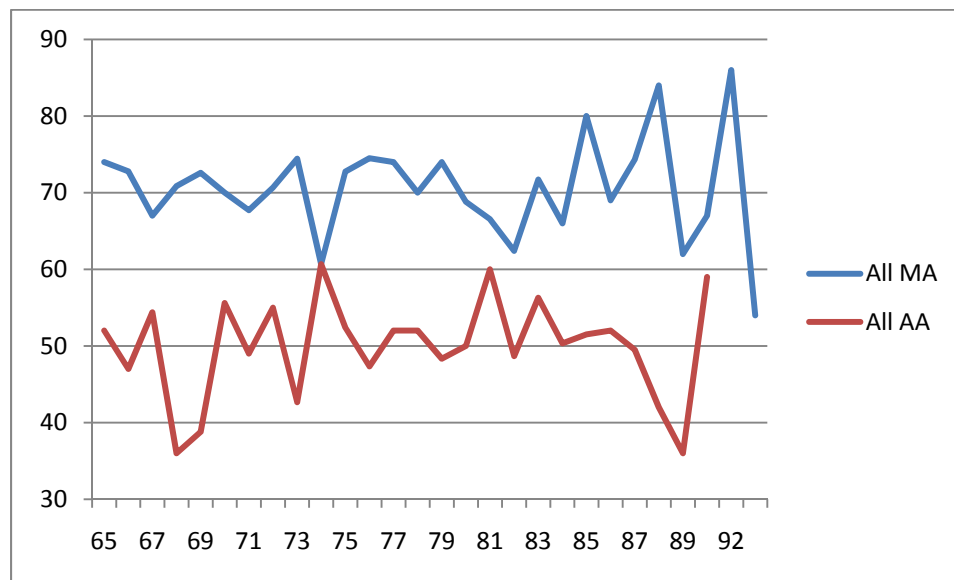


Figure 173: Medial Rotation of the Shoulder

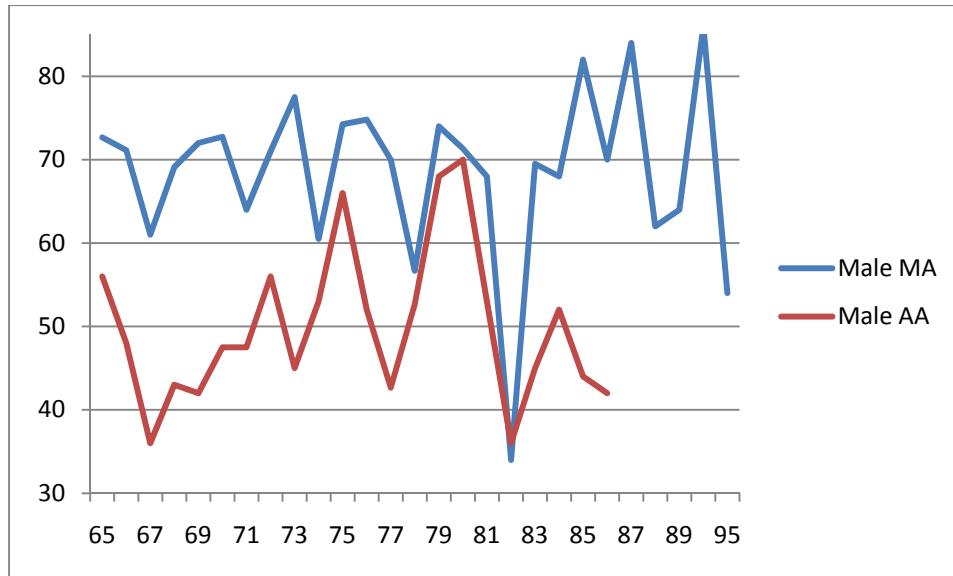


Figure 174: Medial Rotation of the Shoulder

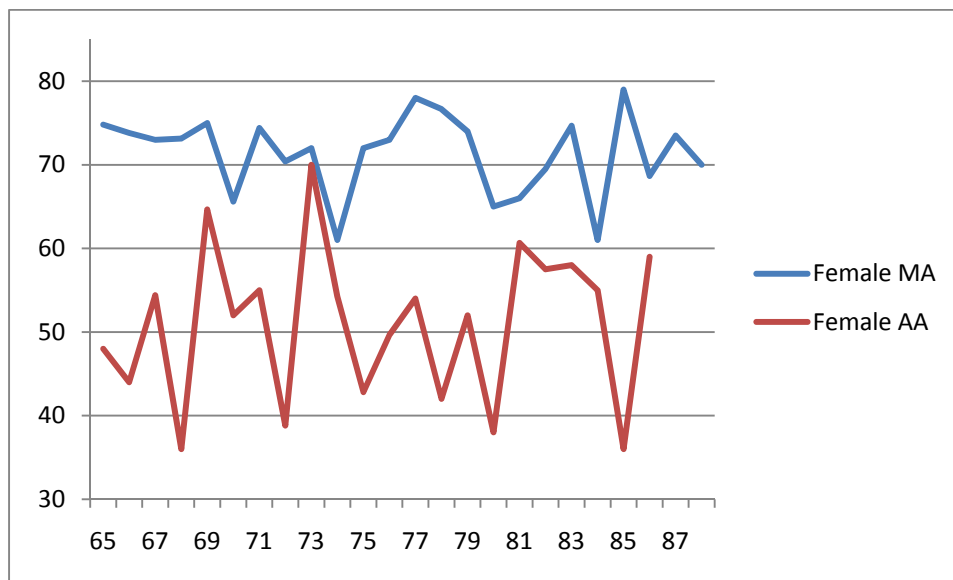


Figure 175: Medial Rotation of the Shoulder

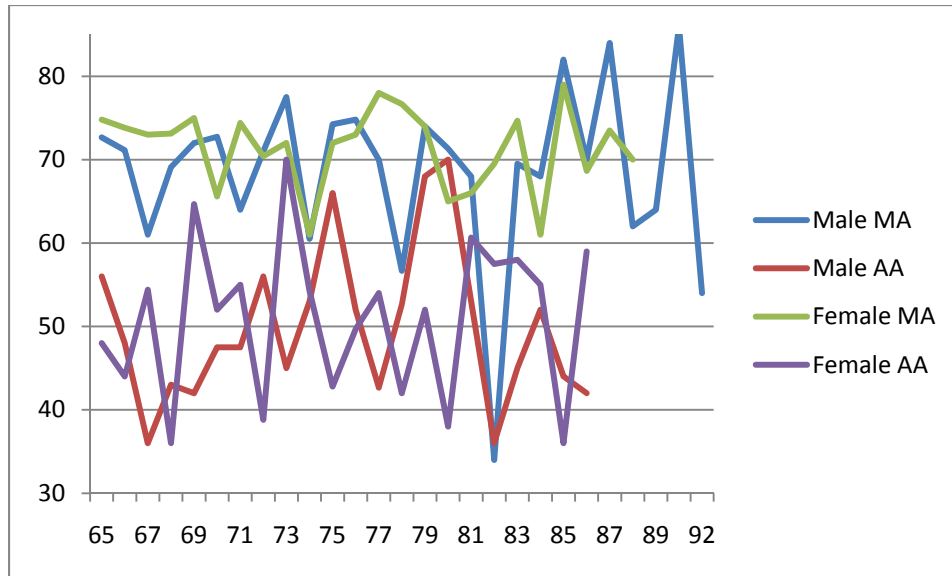


Figure 176: Medial Rotation of the Shoulder

Abduction of the Shoulder

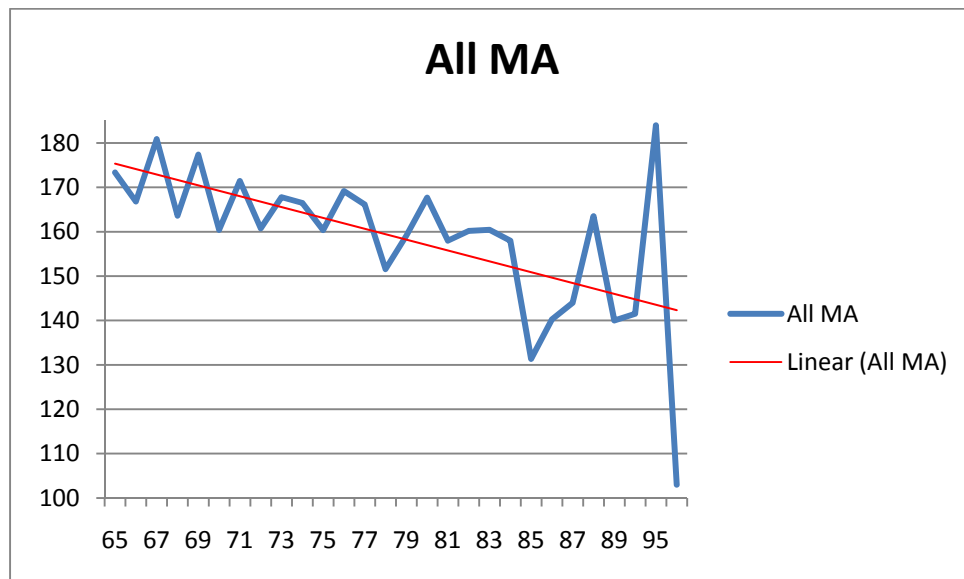


Figure 177: Abduction of the Shoulder

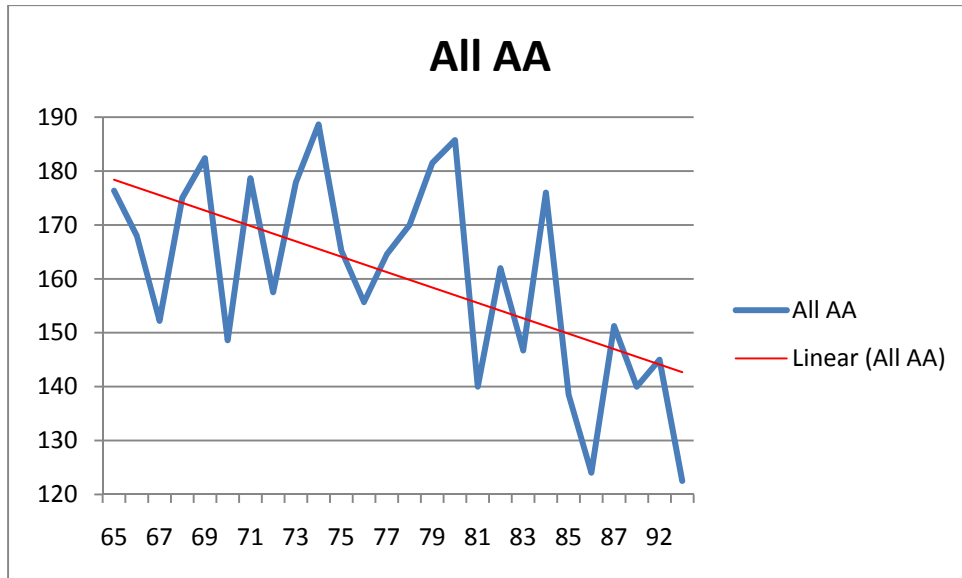


Figure 178: Abduction of the Shoulder

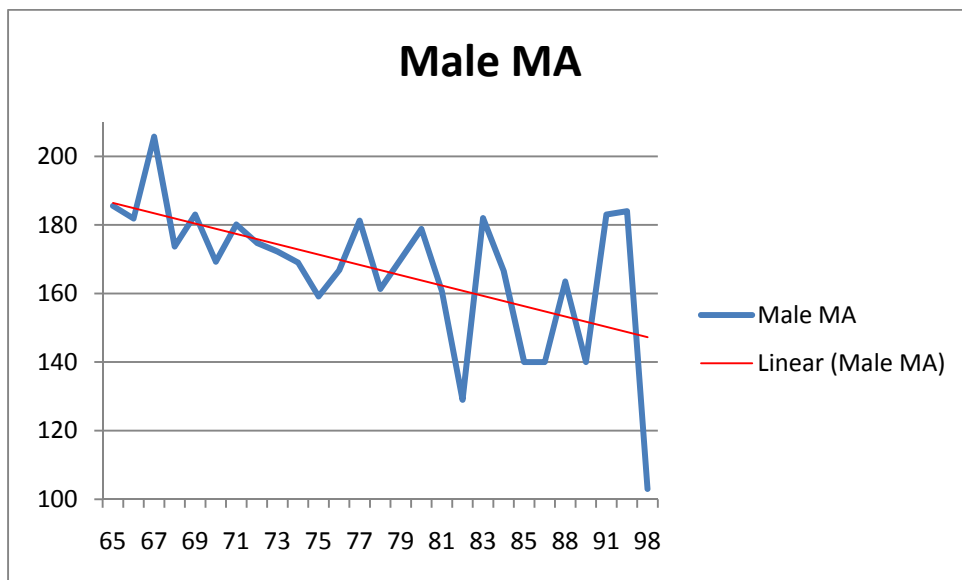


Figure 179: Abduction of the Shoulder

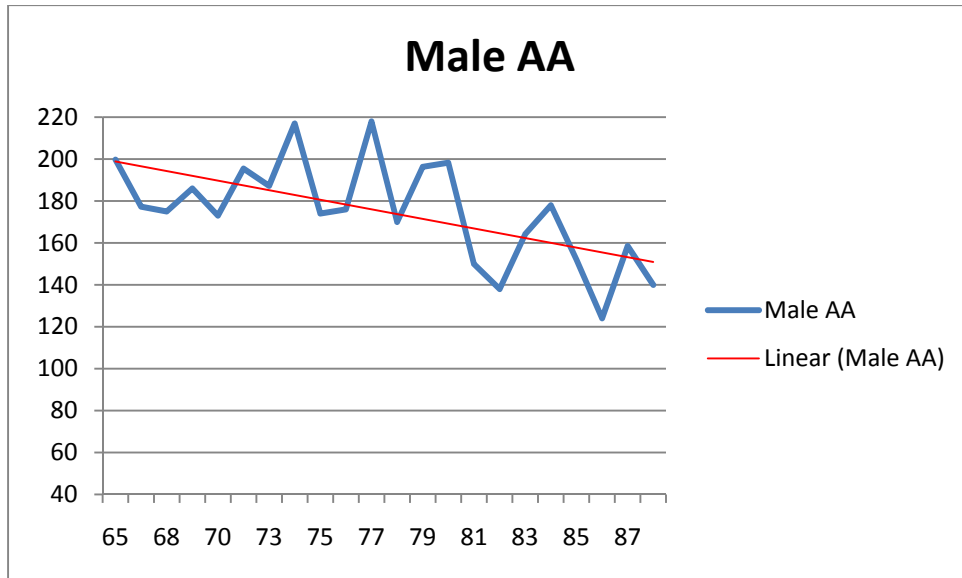


Figure 180: Abduction of the Shoulder

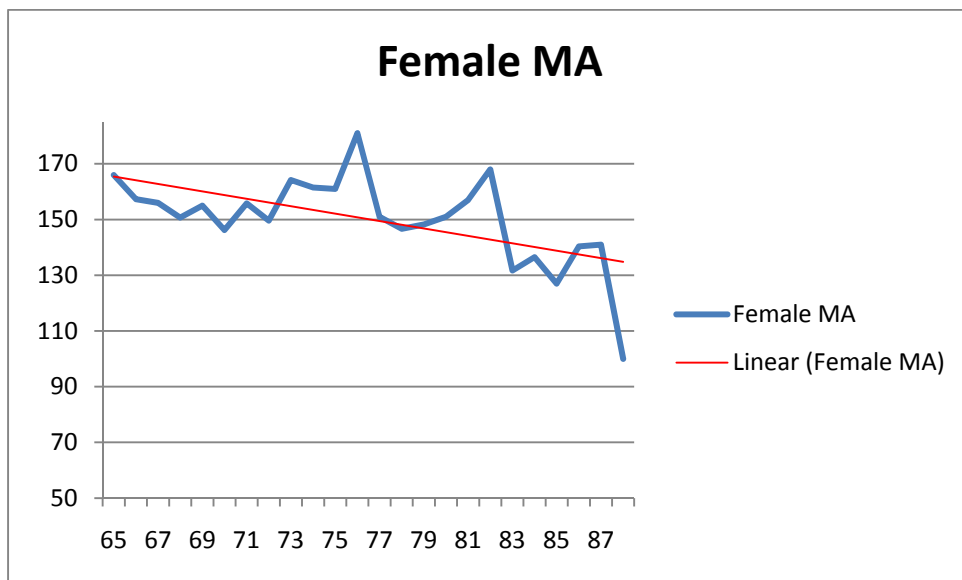


Figure 181: Abduction of the Shoulder

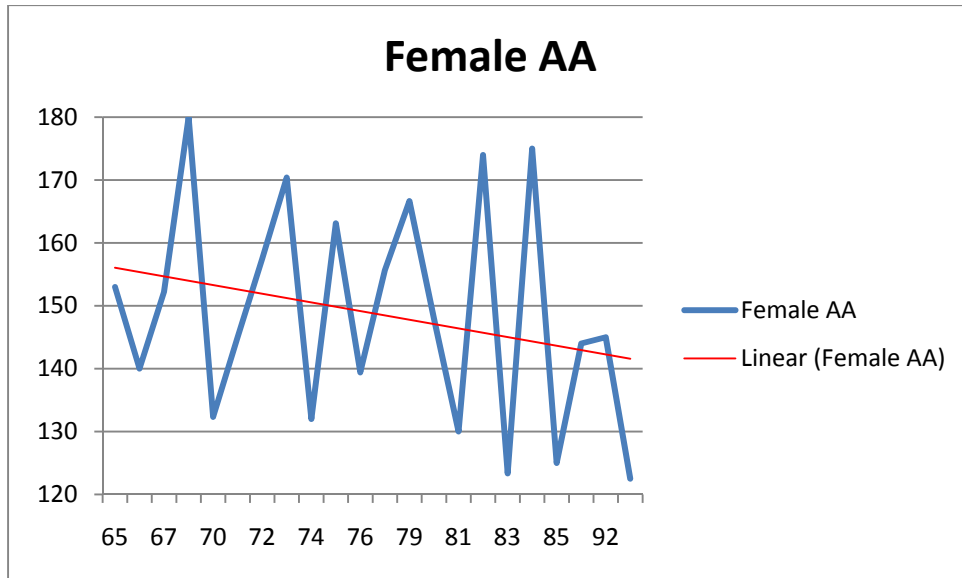


Figure 182: Abduction of the Shoulder

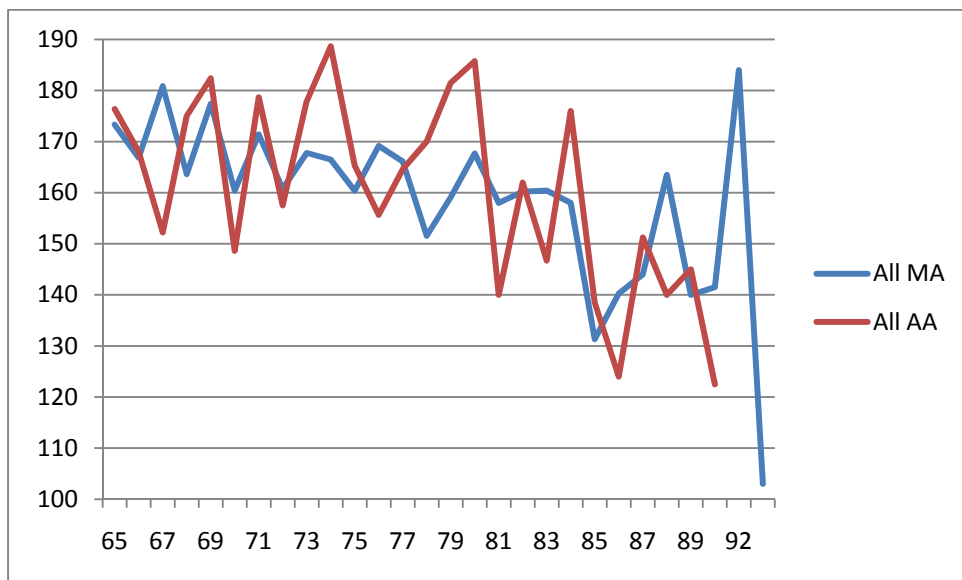


Figure 183: Abduction of the Shoulder

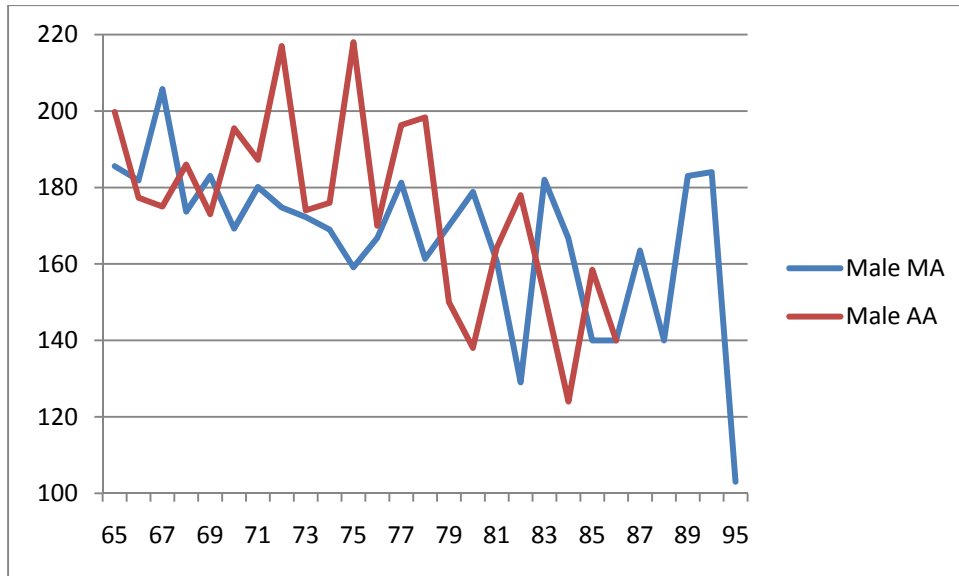


Figure 184: Abduction of the Shoulder

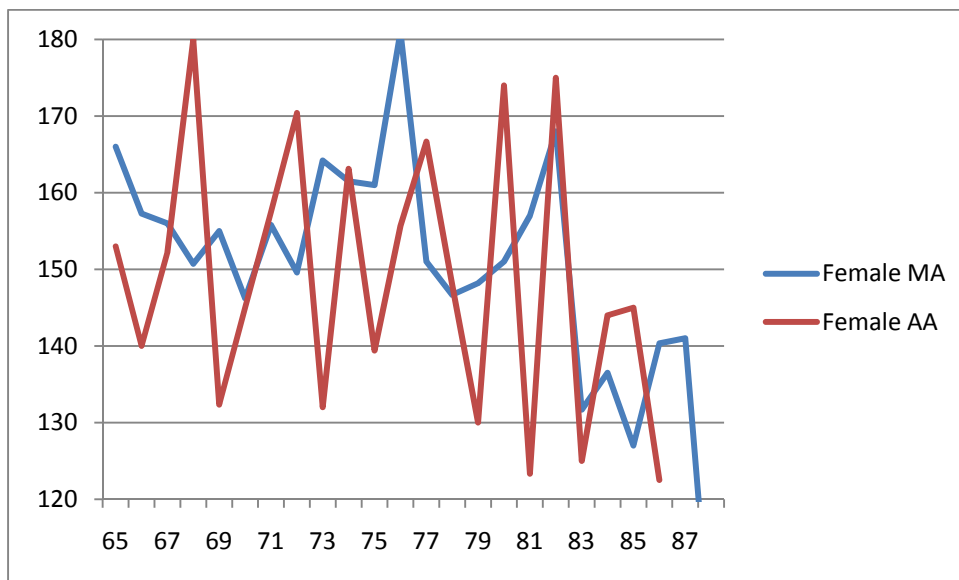


Figure 185: Abduction of the Shoulder

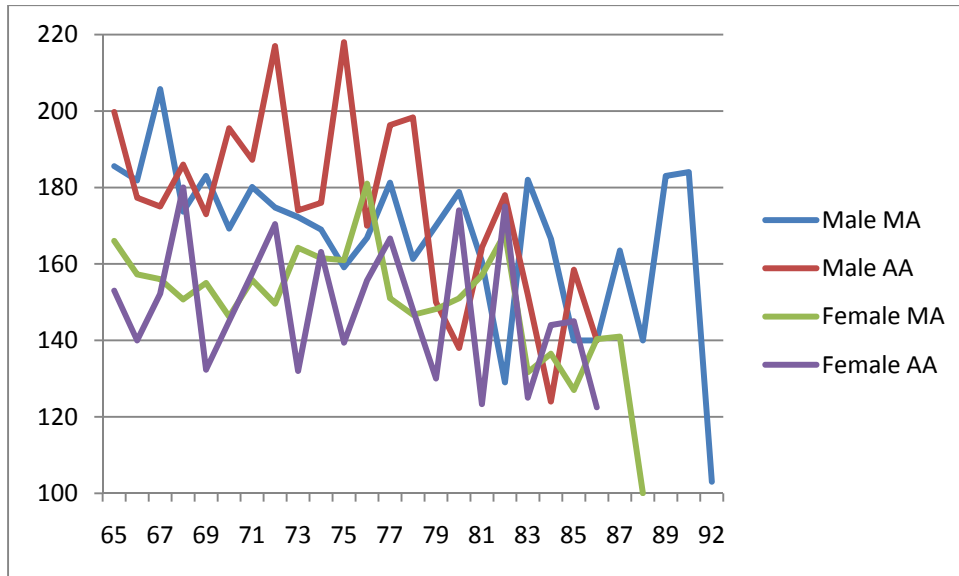


Figure 186: Abduction of the Shoulder

Adduction of the Shoulder

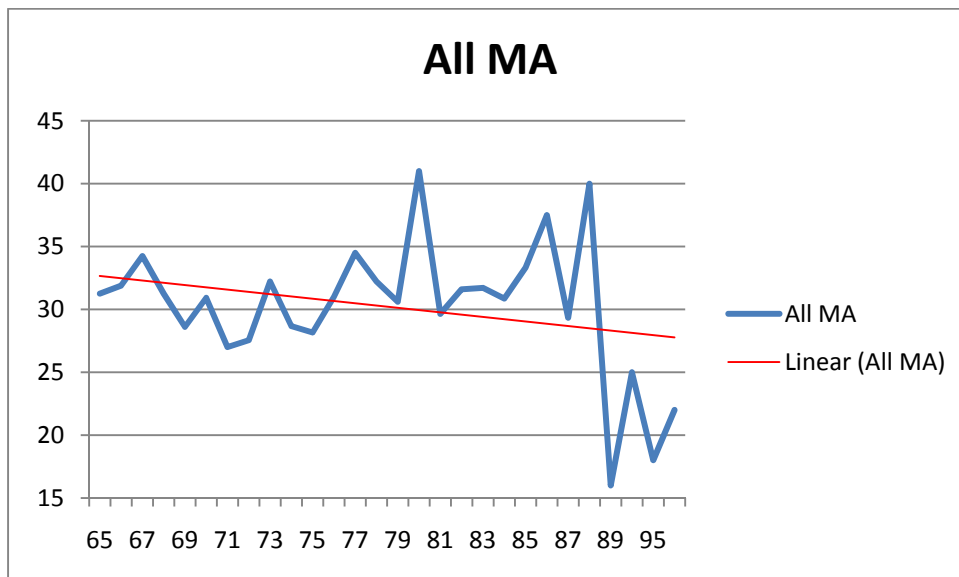


Figure 187: Adduction of the Shoulder

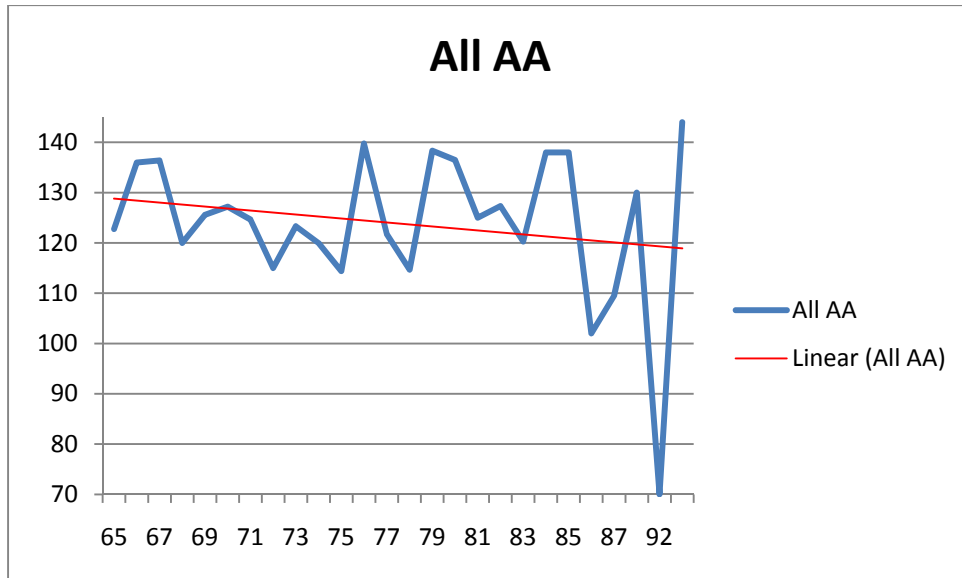


Figure 188: Adduction of the Shoulder

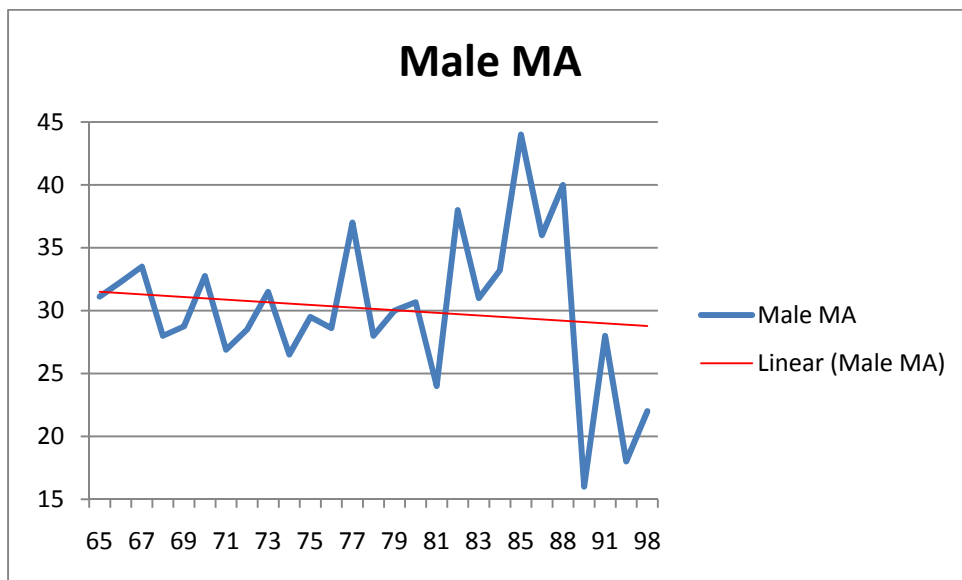


Figure 189: Adduction of the Shoulder

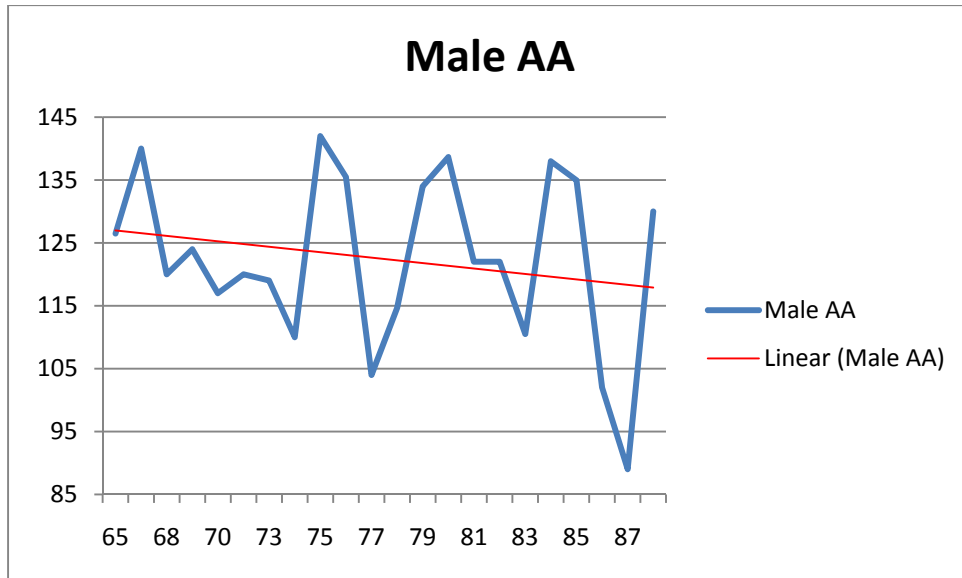


Figure 190: Adduction of the Shoulder

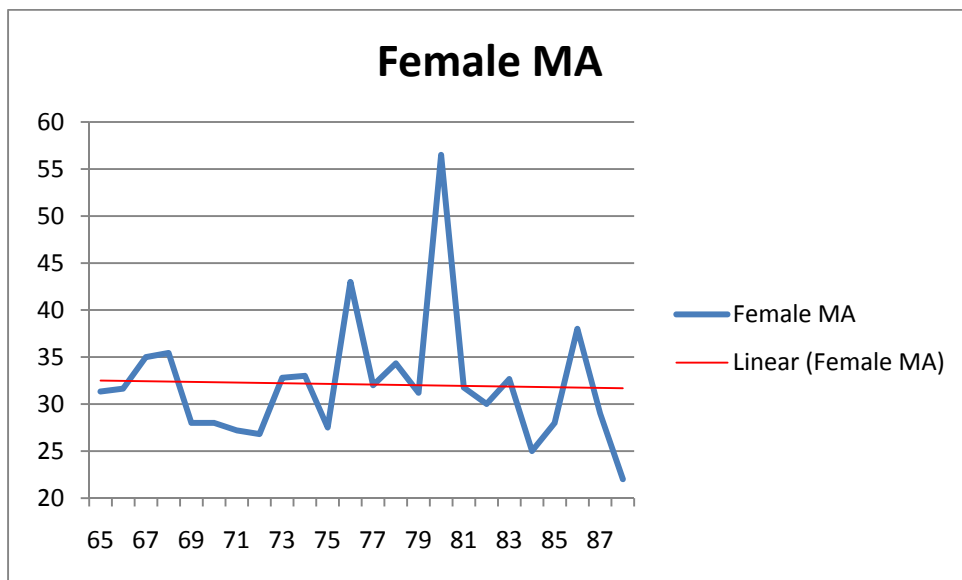


Figure 191: Adduction of the Shoulder

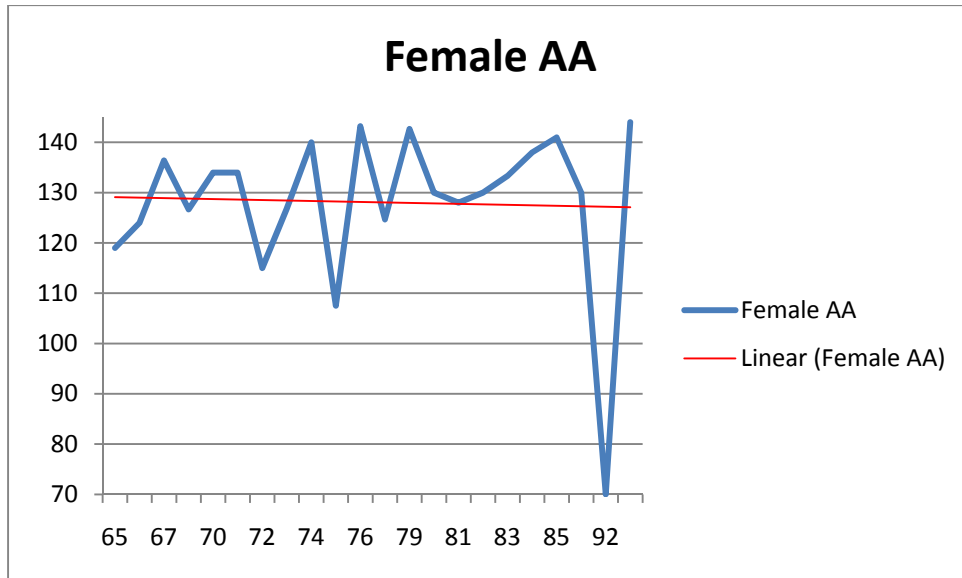


Figure 192: Adduction of the Shoulder

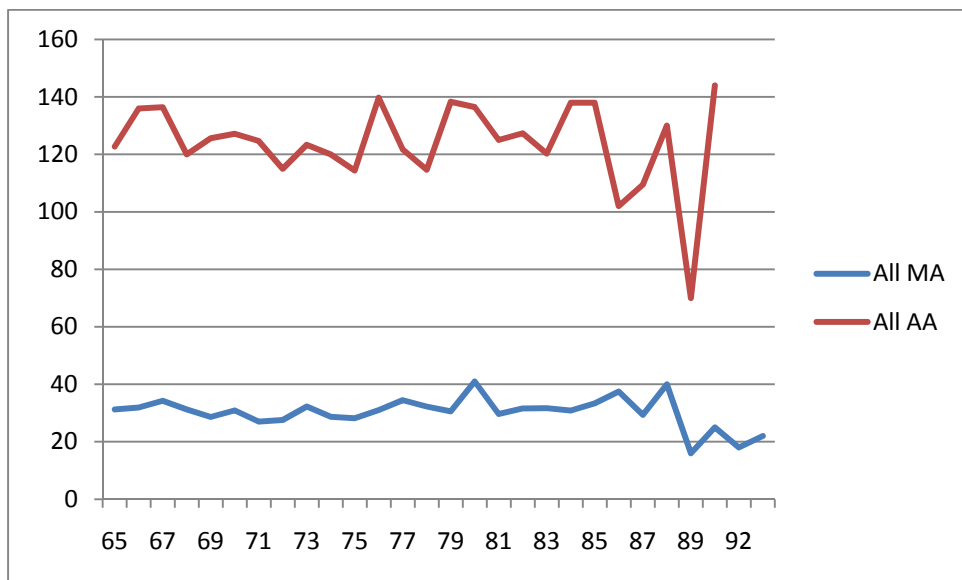


Figure 193: Adduction of the Shoulder

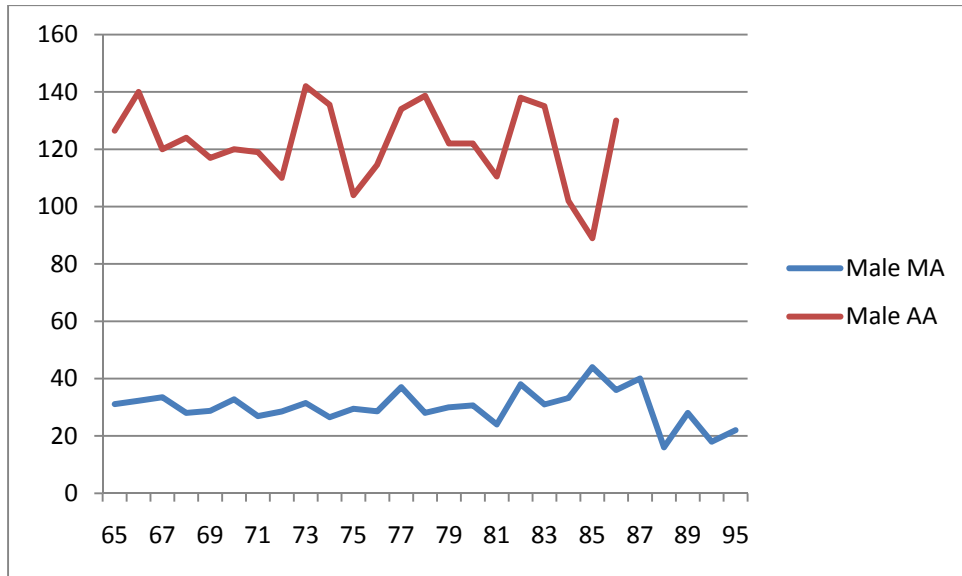


Figure 194: Adduction of the Shoulder

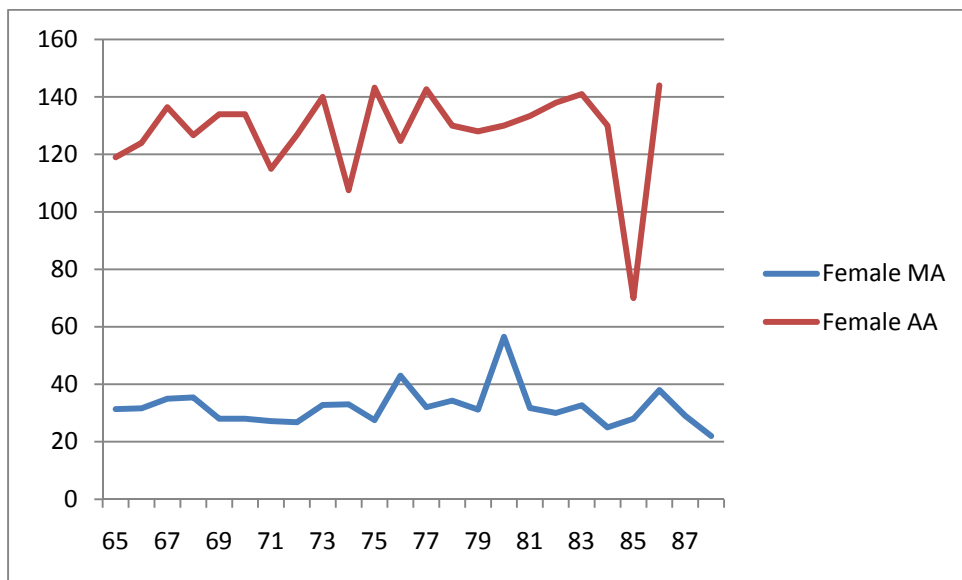


Figure 195: Adduction of the Shoulder

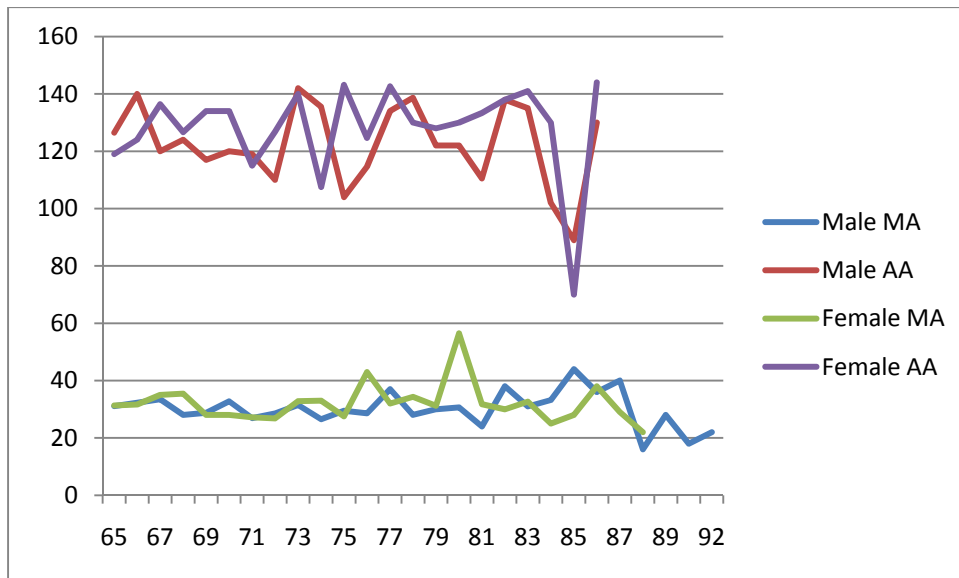


Figure 196: Adduction of the Shoulder

Flexion of the Shoulder

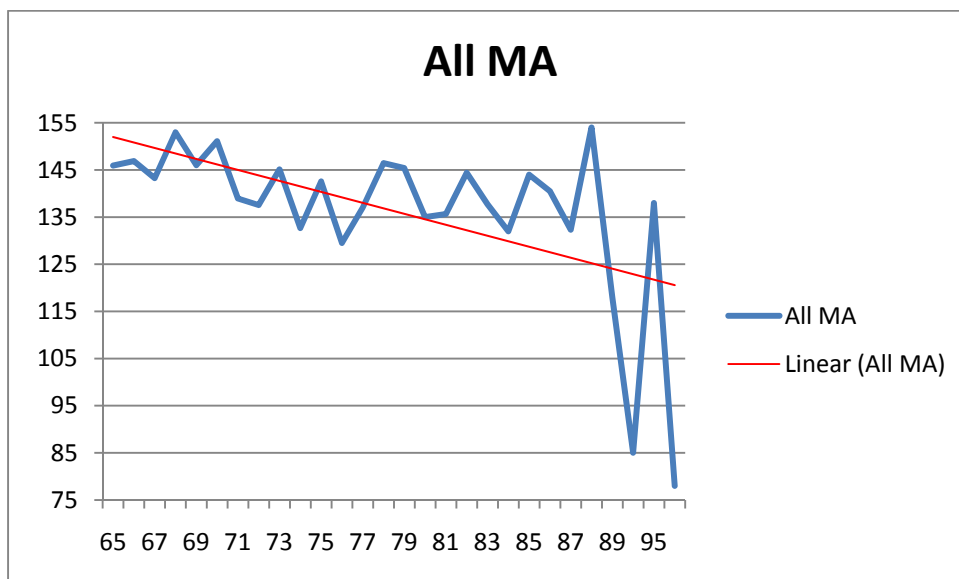


Figure 197: Flexion of the Shoulder

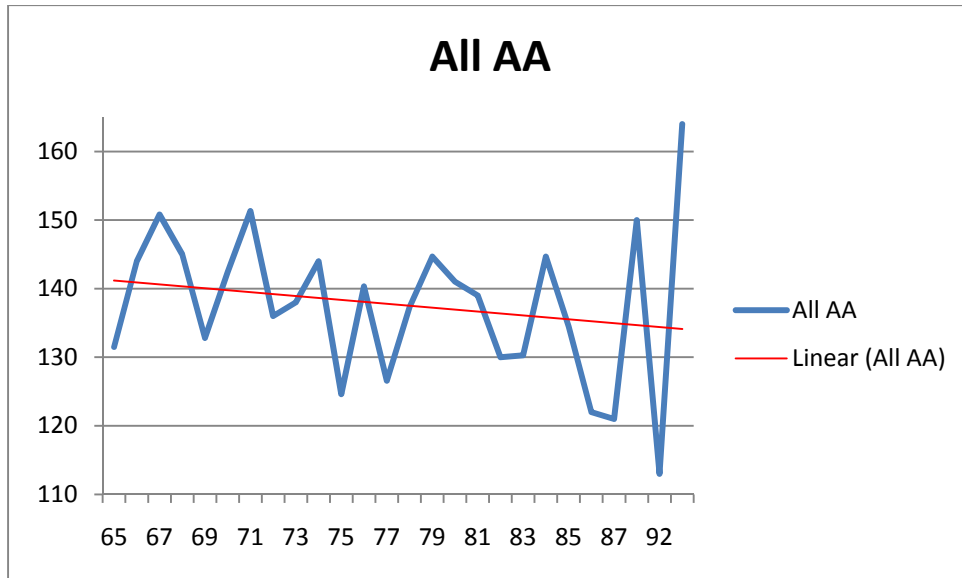


Figure 198: Flexion of the Shoulder

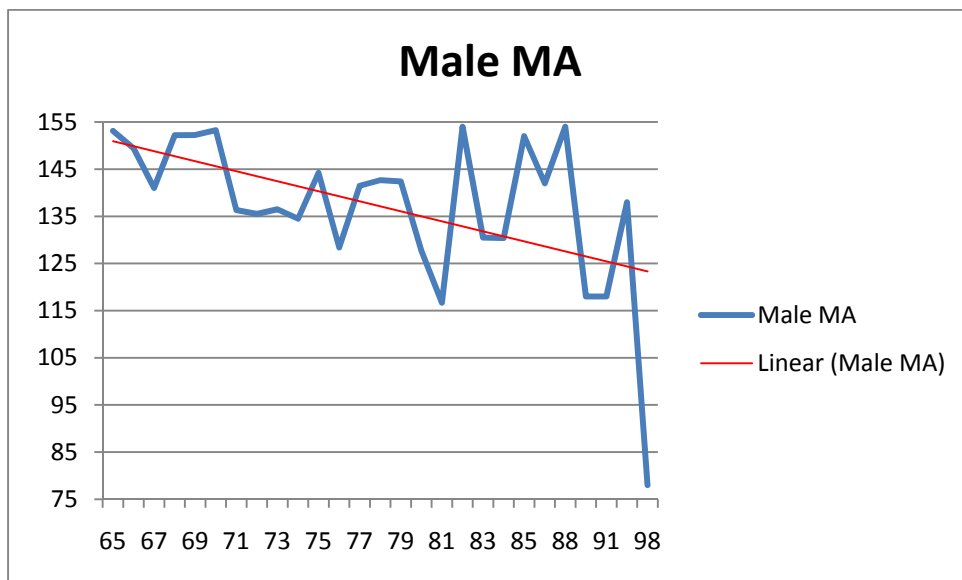


Figure 199: Flexion of the Shoulder

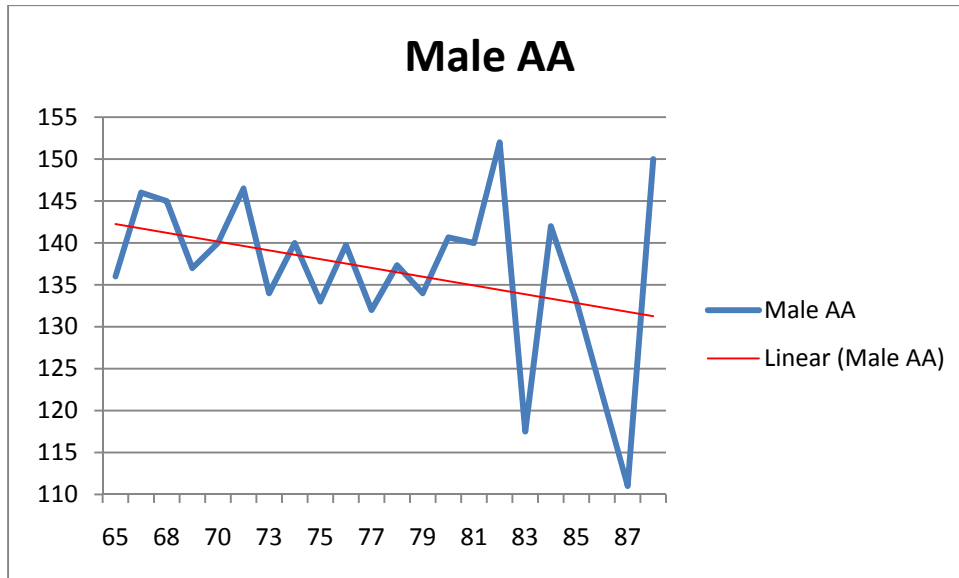


Figure 200: Flexion of the Shoulder

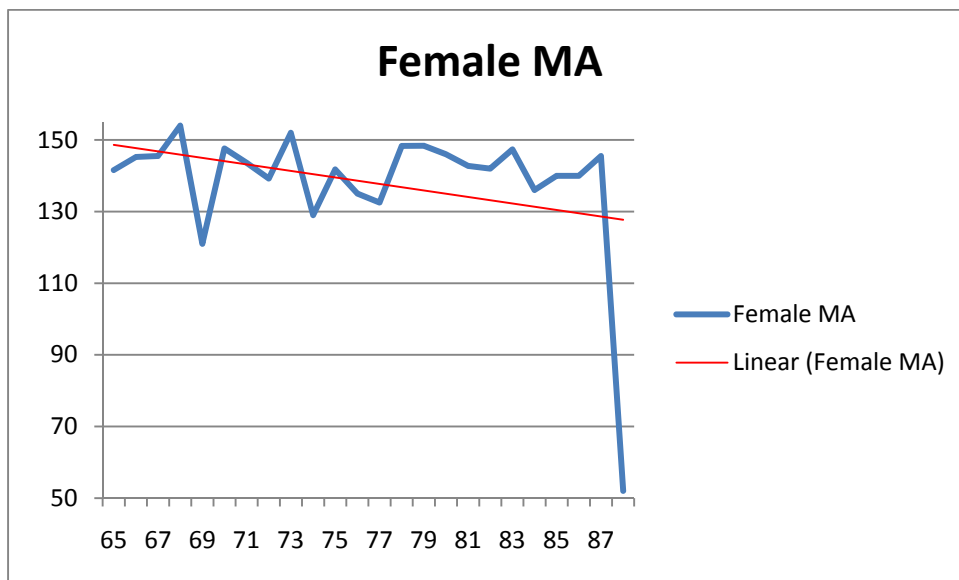


Figure 201: Flexion of the Shoulder

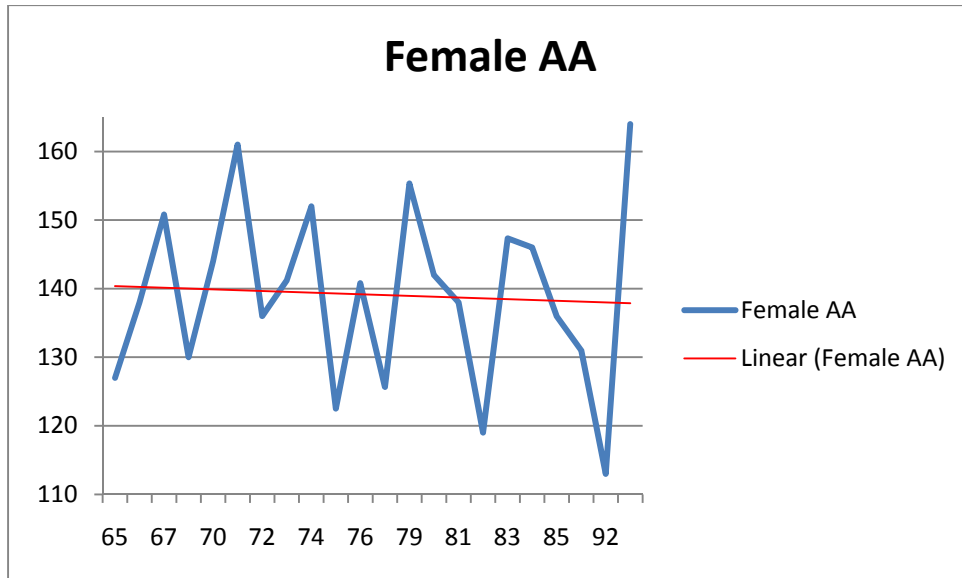


Figure 202: Flexion of the Shoulder

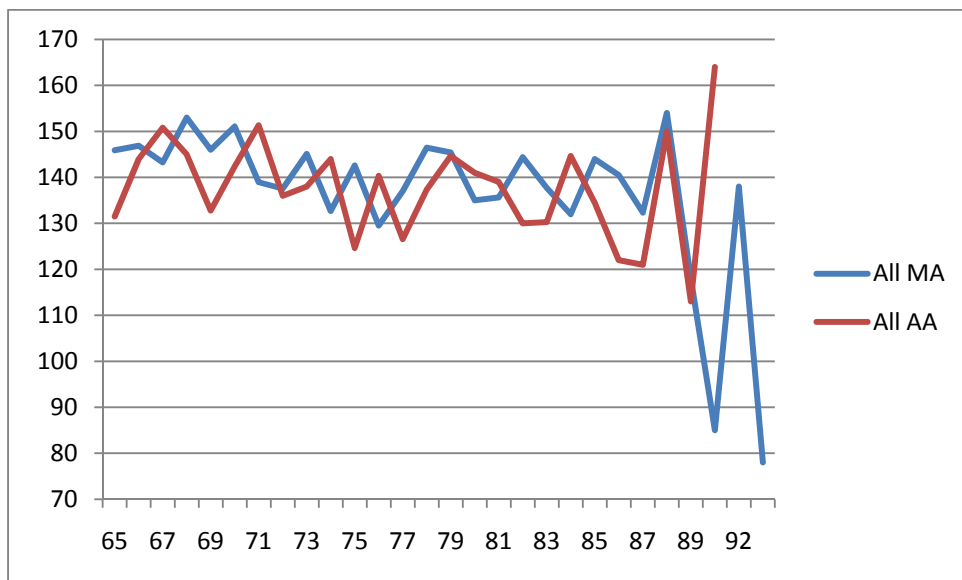


Figure 203: Flexion of the Shoulder

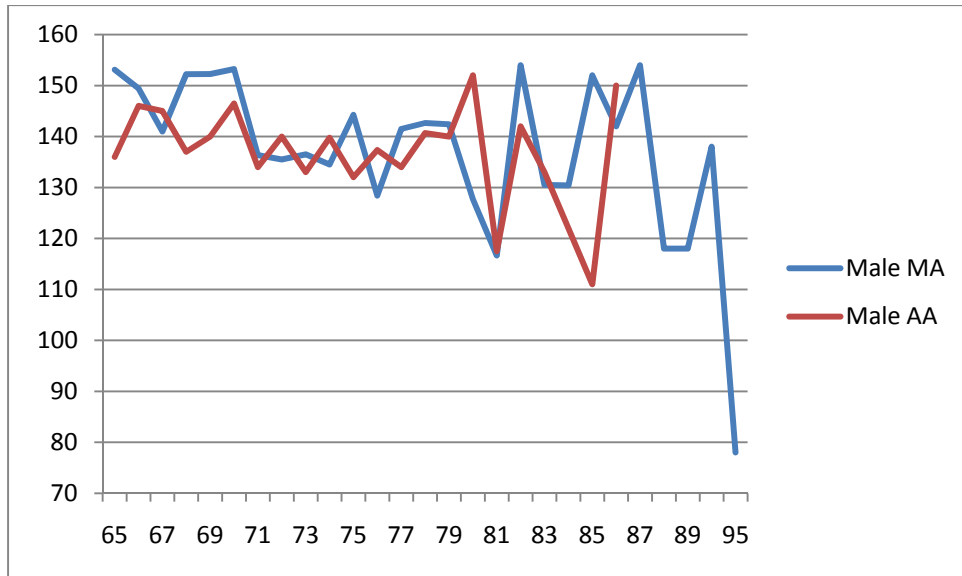


Figure 204: Flexion of the Shoulder

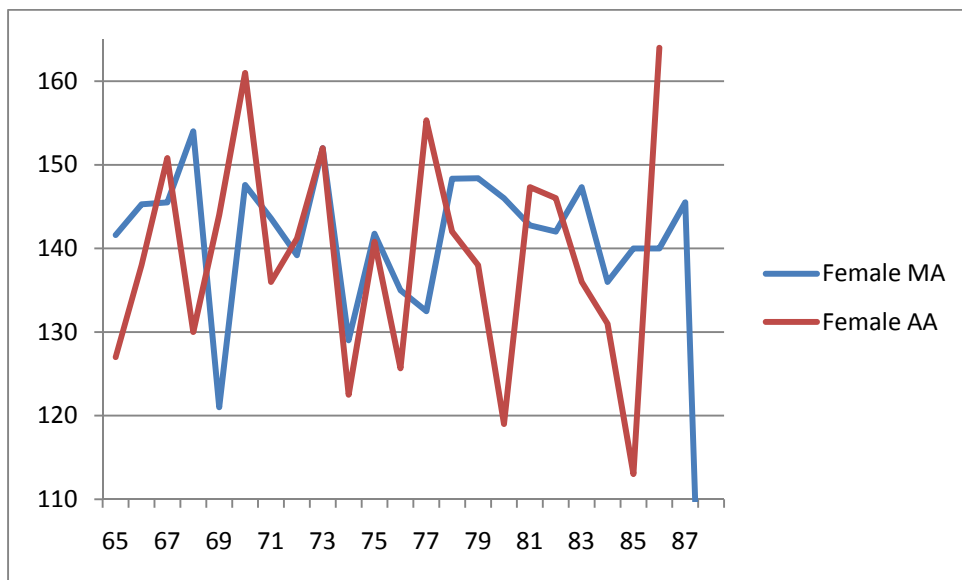


Figure 205: Flexion of the Shoulder

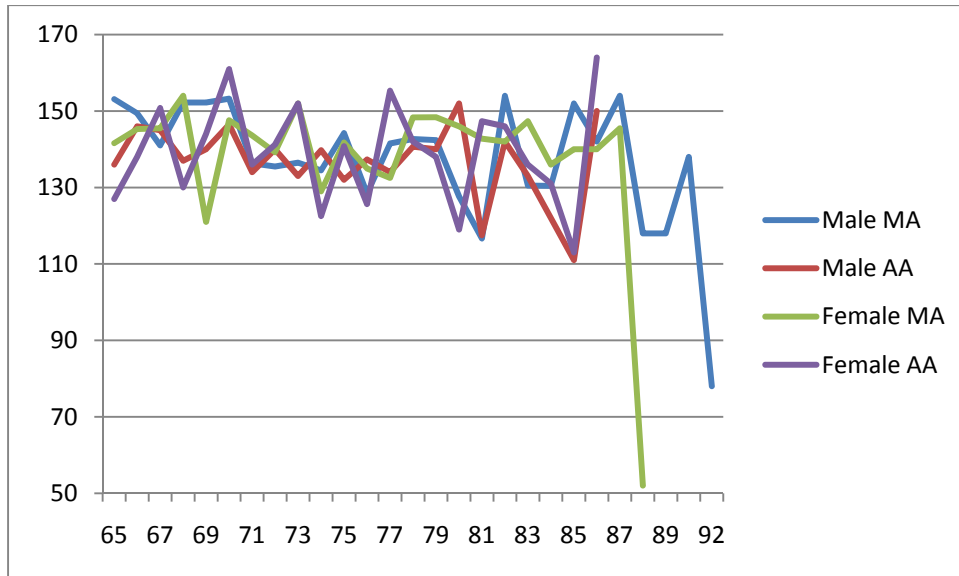


Figure 206: Flexion of the Shoulder

Extension of the Shoulder

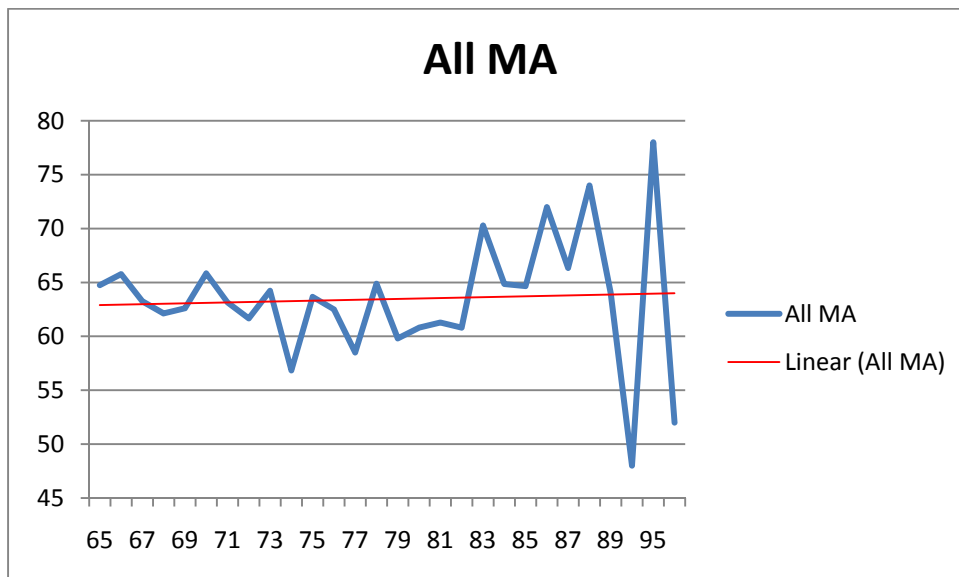


Figure 207: Extension of the Shoulder

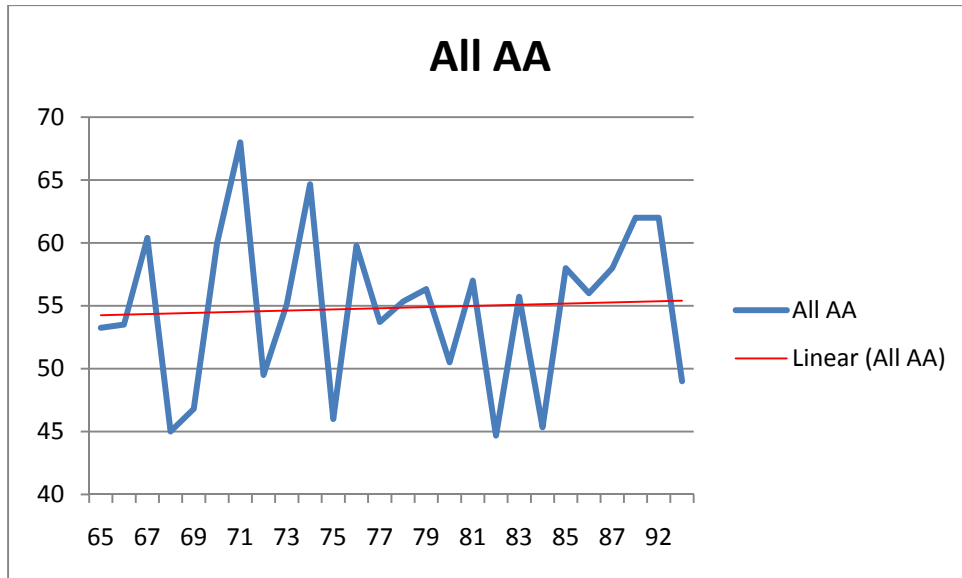


Figure 208: Extension of the Shoulder

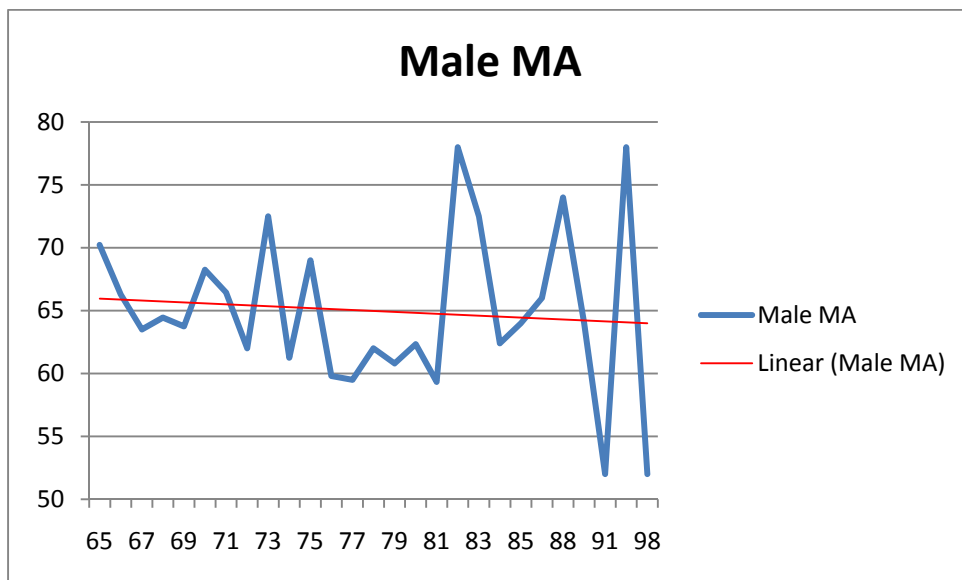


Figure 209: Extension of the Shoulder

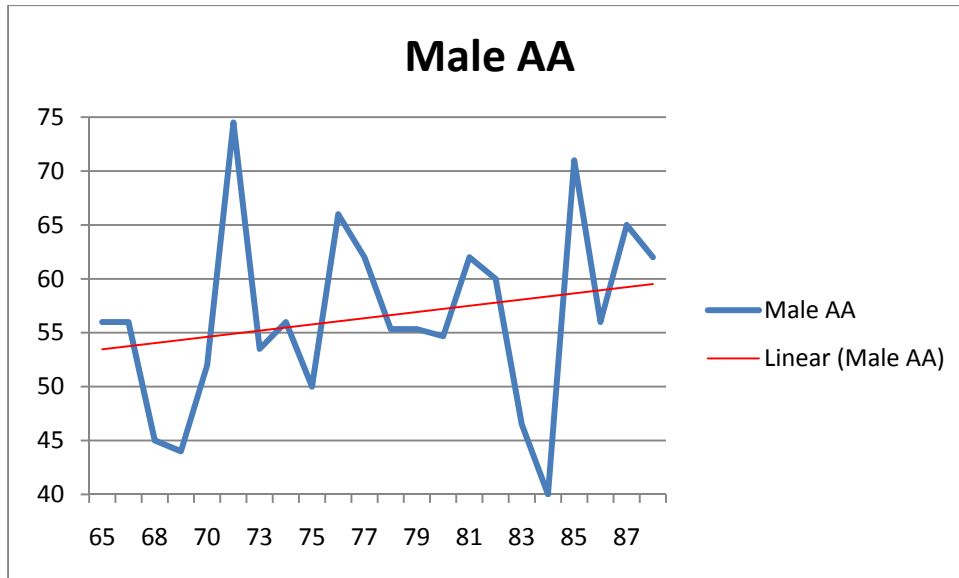


Figure 210: Extension of the Shoulder

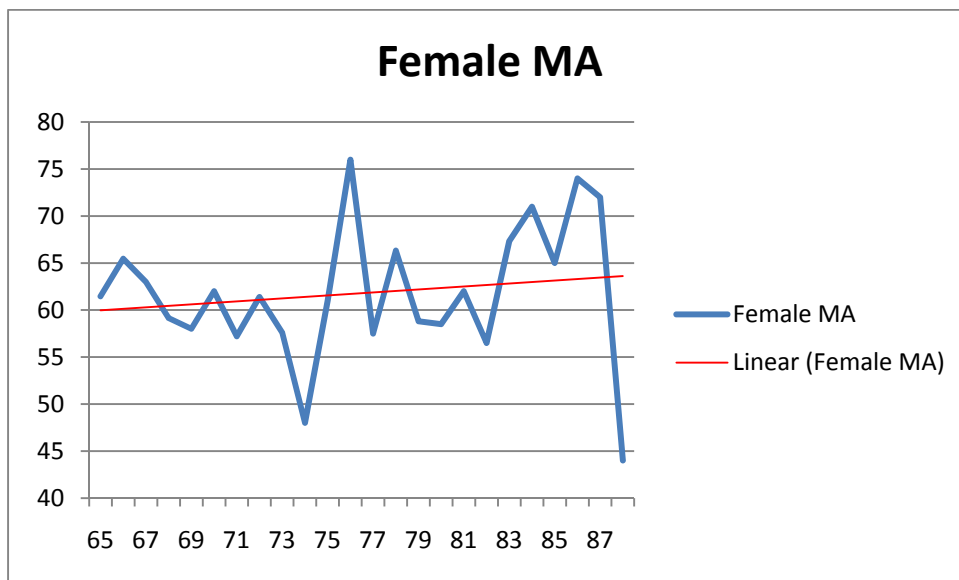


Figure 211: Extension of the Shoulder

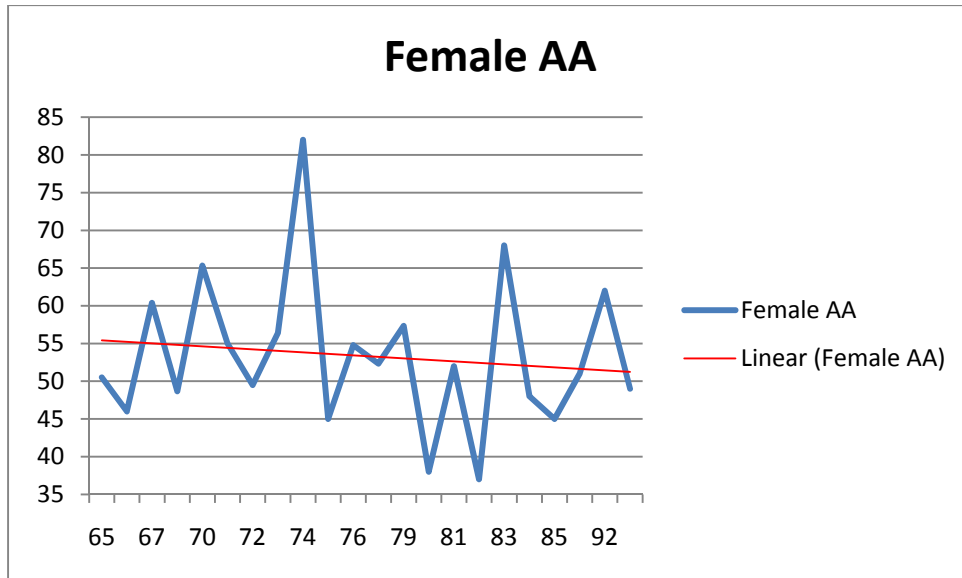


Figure 212: Extension of the Shoulder

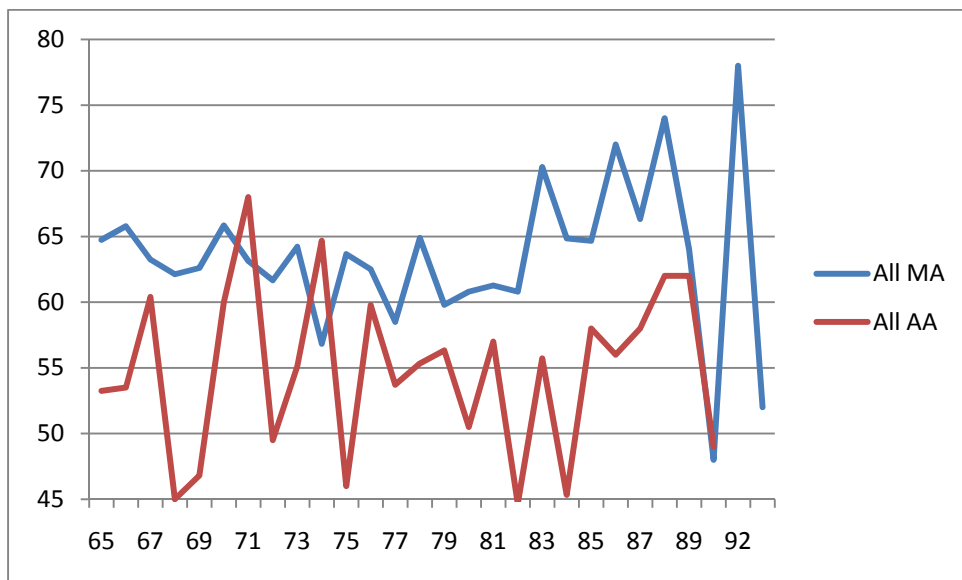


Figure 213: Extension of the Shoulder

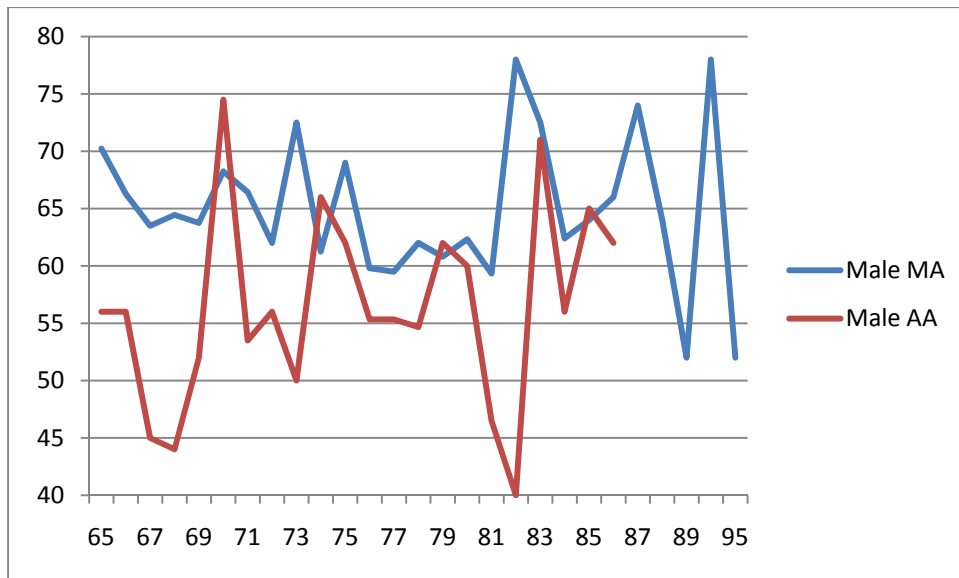


Figure 214: Extension of the Shoulder

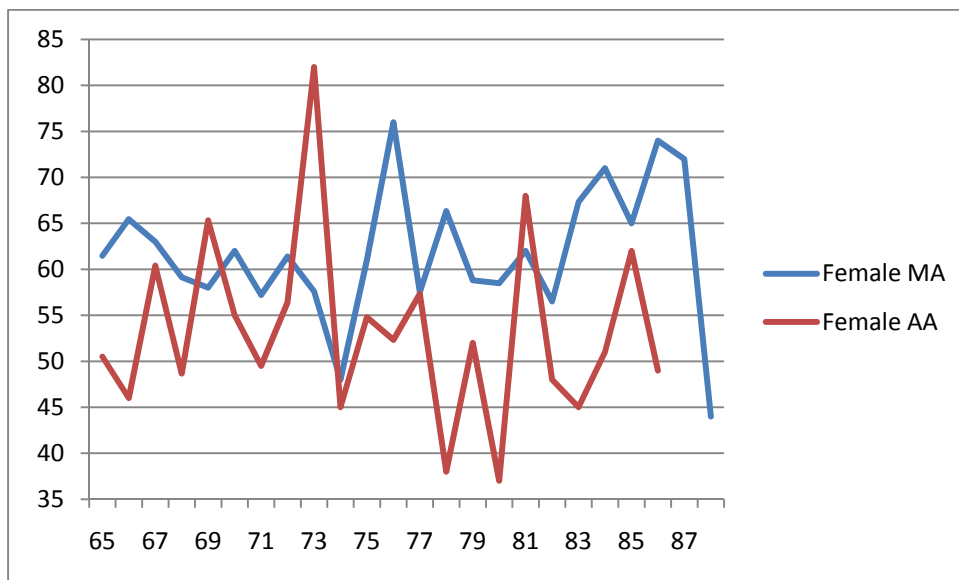


Figure 215: Extension of the Shoulder

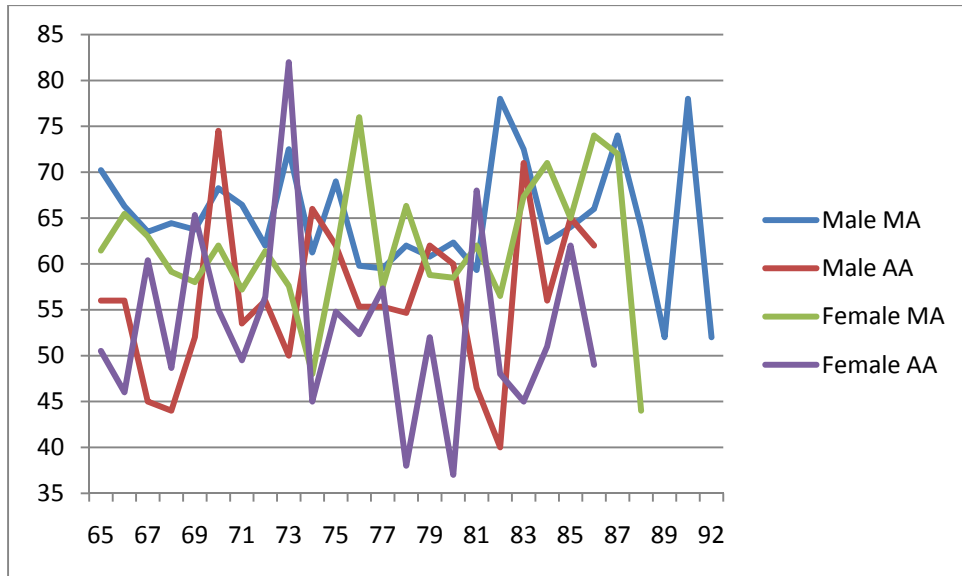


Figure 216: Extension of the Shoulder

Flexion of the Elbow

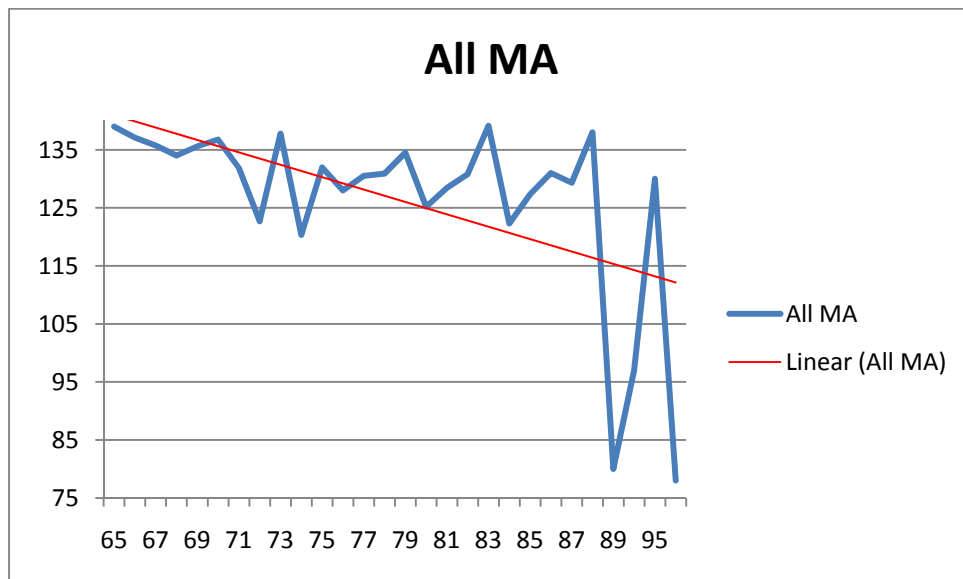


Figure 217: Flexion of the Elbow

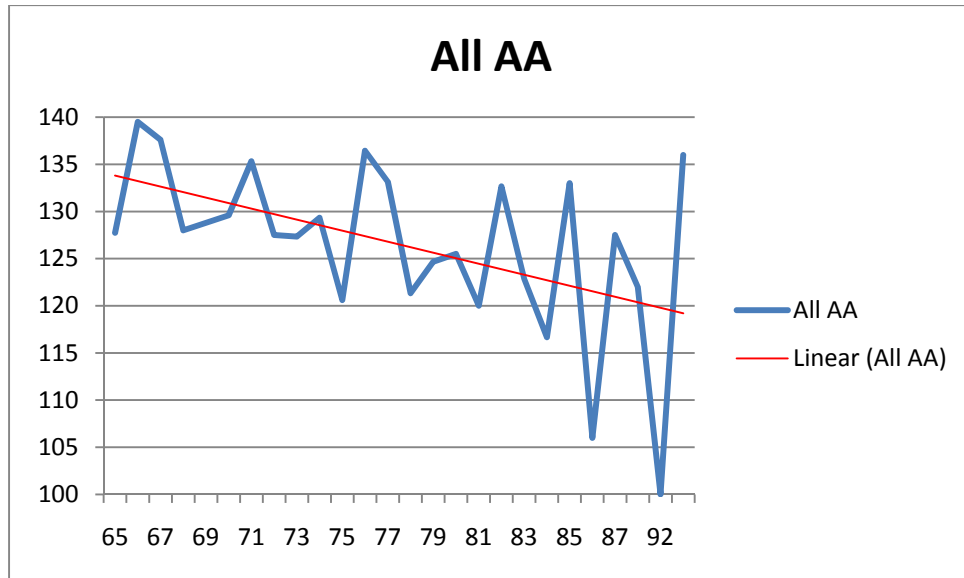


Figure 218: Flexion of the Elbow

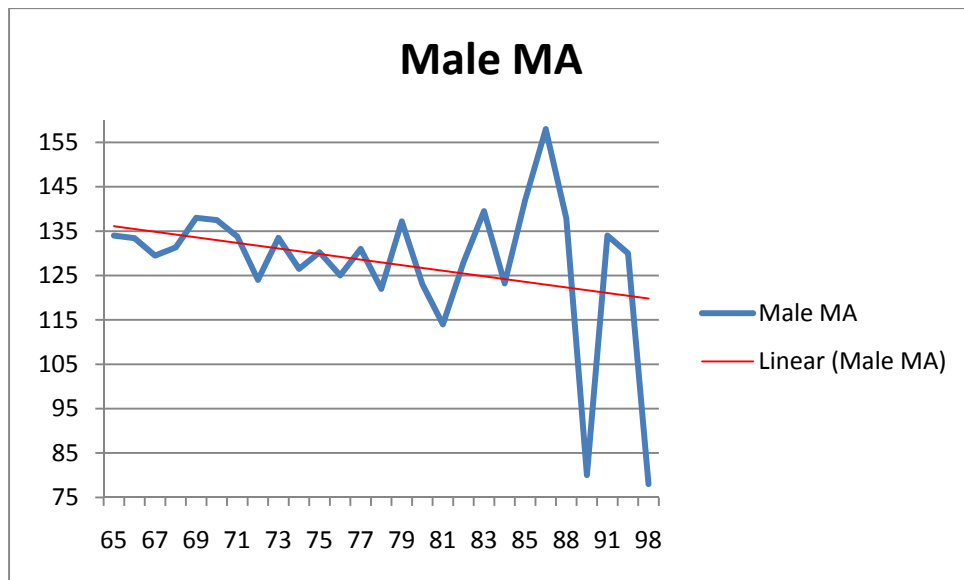


Figure 219: Flexion of the Elbow

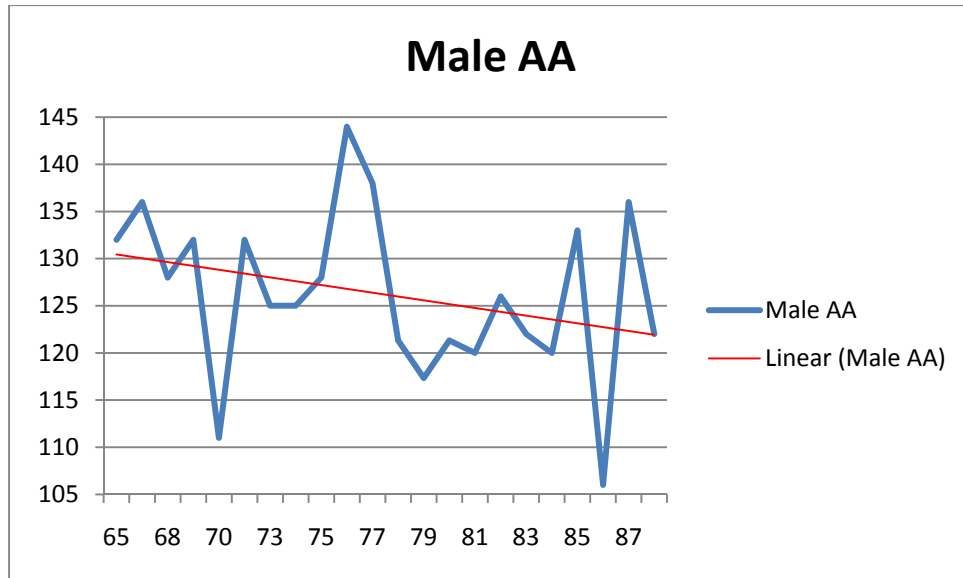


Figure 220: Flexion of the Elbow

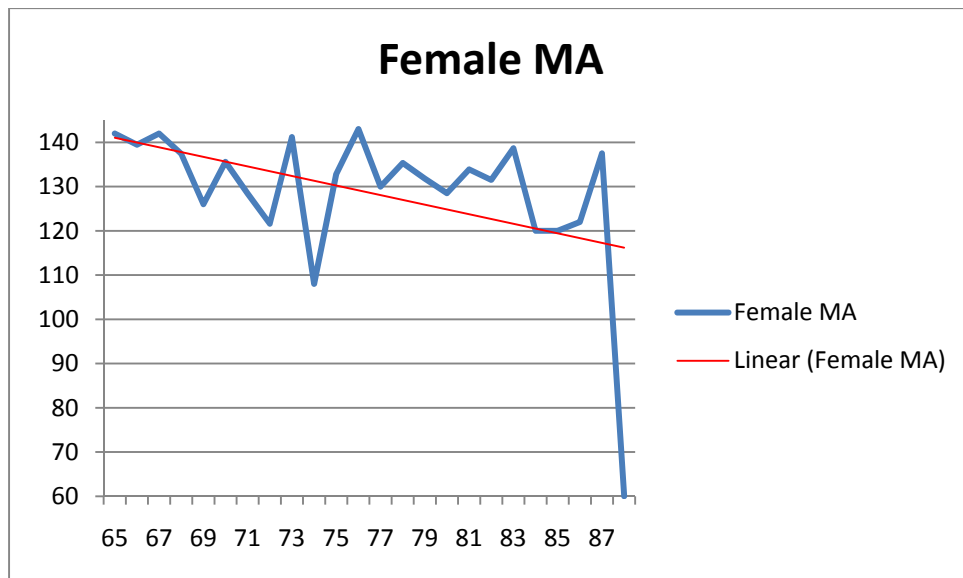


Figure 221: Flexion of the Elbow

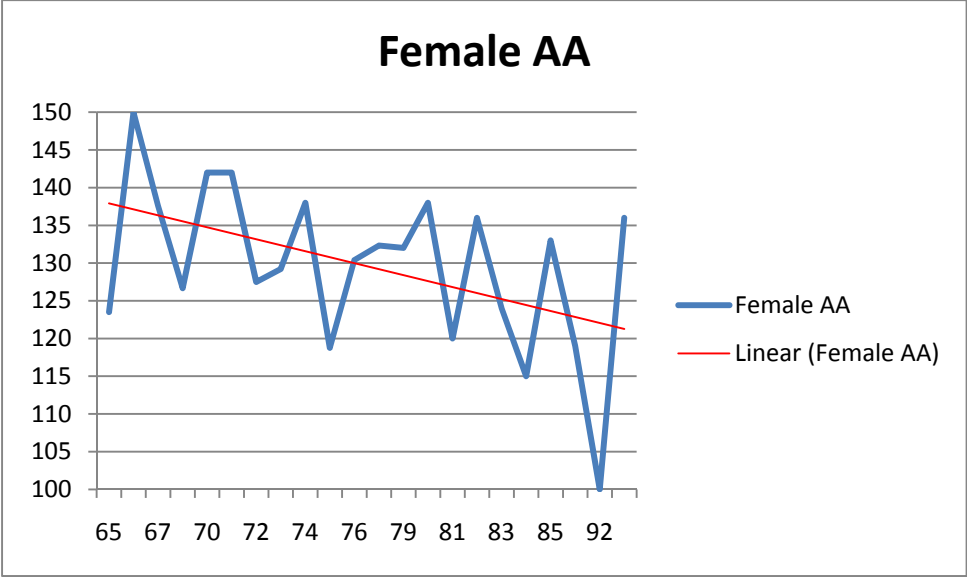


Figure 222: Flexion of the Elbow

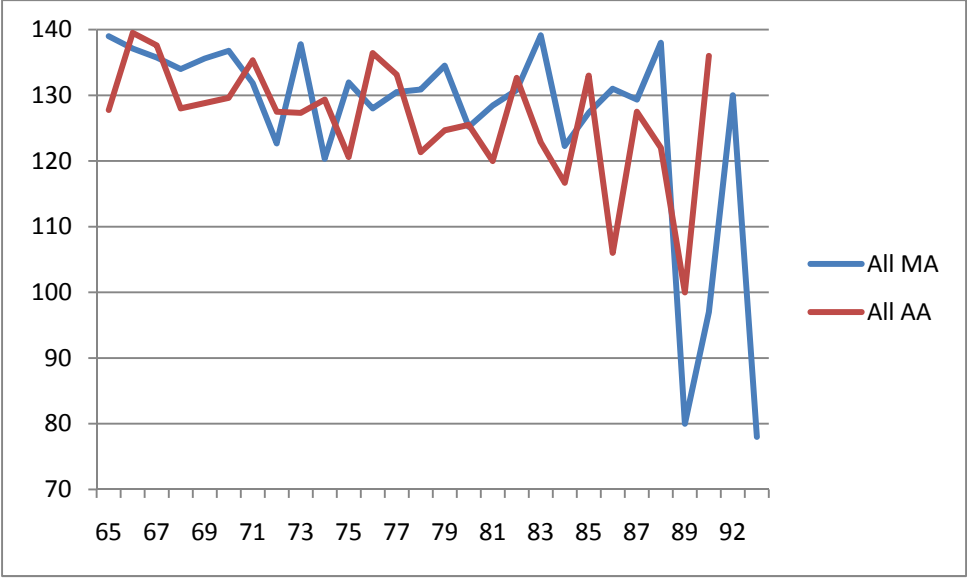


Figure 223: Flexion of the Elbow

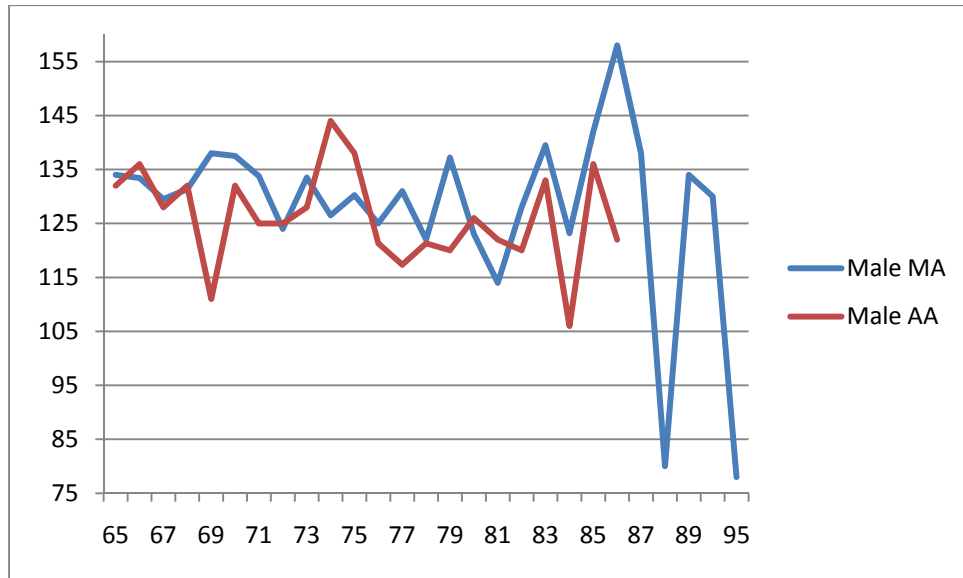


Figure 224: Flexion of the Elbow

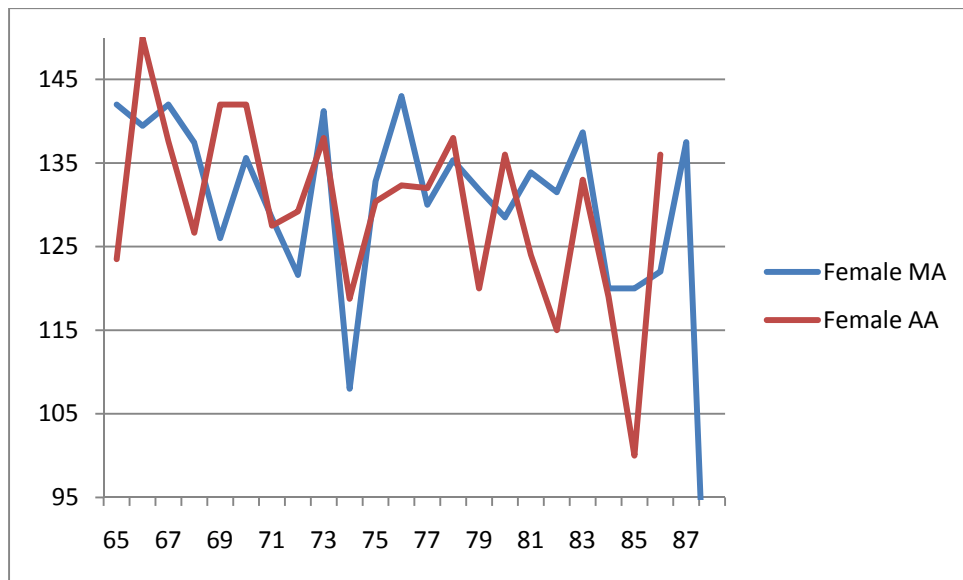


Figure 225: Flexion of the Elbow

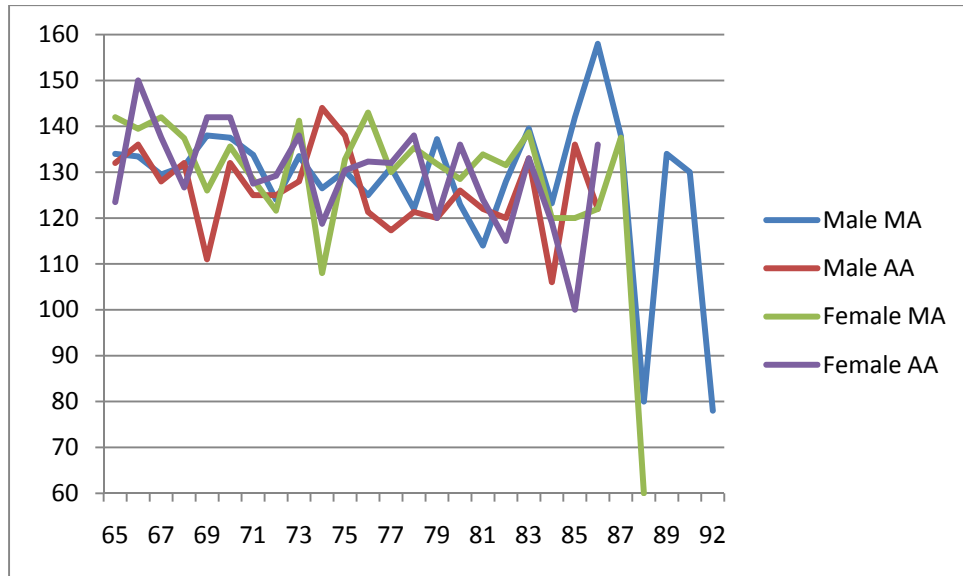


Figure 226: Flexion of the Elbow

INSTRUMENTAL AND PHYSICAL ACTIVITIES OF DAILY LIVING MEASURED IN THIS STUDY WITH OARS MULTIDIMENSIONAL QUESTIONNAIRE

Activities of daily living

Instrumental ADL

56. Can you use the telephone.....

- 2 without help, including looking up numbers and dialing
- 1 with some help (can answer phone or dial operator in an emergency but need a special phone or help in getting the number or dialing) or
- 0 are you completely unable to use the telephone

Response	AA	MA
2	0.93	0.96
1	0.06	0.04
0	0.01	0.01

57. Can you get to places out of walking distance.....

- 2 without help (drive your own car, or travel alone on buses or taxies)
- 1 with some help (need someone to help you or go with you when traveling)
- 0 are you unable to travel unless emergency arrangements are made for a specialized vehicle like an ambulance?

Response	AA	MA
2	0.83	0.79
1	0.14	0.18
0	0.03	0.03

58. Can you go for shopping for groceries or clothes (assuming subject has transportation)...

- 2 without help (taking care of all shopping needs yourself assuming you had transportation)
- 1 with some help (need someone to go with you on all shopping trips)
- 0 are you completely unable to do any shopping

Response	AA	MA
2	0.85	0.79
1	0.13	0.20
0	0.02	0.01

59. Can you prepare your own meals...

- 2 without help (plan and cook full meals yourself)

- 1 with some help (can prepare some things but unable to cook full meals yourself)
- 0 are you completely unable to prepare any meals?

Response	AA	MA
2	0.87	0.95
1	0.10	0.05
0	0.03	0.00

60. Can you do your housework....

- 2 without help (can clean floors, etc.)
- 1 with some help (can do light housework but need help with heavy work)
- 0 are you completely unable to do any housework?

Response	AA	MA
2	0.78	0.92
1	0.17	0.08
0	0.05	0.00

61. Can you take your own medicine...

- 2 without help (in the right does at the right time)
- 1 with some help (able to take medicine if someone prepares it for you and/or reminds you to take it)
- 0 are you completely unable to take your medicines?

Response	AA	MA
2	0.95	0.96
1	0.04	0.04
0	0.01	0.00

62. Can you handle your own money....

- 2 without help (write checks, pay bills, etc.)
- 1 with some help (manage day-to-day buying but need help with managing your checkbook and paying your bills)
- 0 are you completely unable to handle money?

Response	AA	MA
2	0.92	0.94
1	0.06	0.06
0	0.02	0.00

Physical ADLs

63. Can you eat...

- 2 without help (able to feed yourself completely)
- 1 with some help (need help with cutting, etc.)
- 0 are you completely unable to feed yourself?

Response	AA	MA
2	0.99	0.99
1	0.00	0.01
0	0.00	0.00

64. Can you dress and undress yourself?

- 2 without help (able to pick out clothes, dress and undress yourself)
- 1 with some help
- 0 are you completely unable to dress and undress yourself?

Response	AA	MA
2	0.97	0.96
1	0.03	0.04
0	0.00	0.00

65. Can you take care of your appearance, for example combing your hair and (for men) shaving...

- 2 without help
- 1 with some help
- 0 are you completely unable to maintain your appearance yourself?

Response	AA	MA
2	0.97	0.99
1	0.03	0.01
0	0.01	0.00

66. Can you walk...

- 2 without help (except from a cane)
- 1 with some help from a person or with the use of a walker, crutches, etc.
- 0 are you completely unable to walk?

Response	AA	MA
2	0.97	0.98
1	0.03	0.02
0	0.00	0.00

67. Can you get in and out of bed...

- 2 without any help or aids
- 1 with some help (either from a person or with the aid of some device)

0 are you totally dependent on someone else to lift you?

Response	AA	MA
2	0.97	0.97
1	0.03	0.03
0	0.00	0.00

68. Can you take a bath or shower...

- 2 without help
- 1 with some help (need some help getting in and out of the tub, or need special attachments on the tub)
- 0 are you completely unable to bathe yourself

Response	AA	MA
2	0.95	0.97
1	0.04	0.03
0	0.01	0.00

69. Do you ever have trouble getting to the bathroom on time...

- 2 No
- 0 Yes
- 1 Have a catheter or colostomy

Response	AA	MA
2	0.92	0.97
1	0.00	0.02
0	0.08	0.01

70. Is there someone who helps you with such things as shopping, housework, bathing, dressing, and getting around...

1 Yes

0 No

Response	AA	MA
1	0.29	0.32
0	0.71	0.68

Physical Health

37. About how many times have you seen a doctor during the past six months other than as an inpatient in a hospital?

	AA	MA
0	0.153846	0.436
1	0.273504	0.216
2	0.205128	0.176
3	0.094017	0.08
4	0.059829	0.036
5	0.025641	0.008
6	0.153846	0.016
7	0	0.004
8	0	0.004
9	0	0
10	0.008547	0.012
11	0	0
12	0.017094	0
13	0	0
14	0.008547	0
15	0	0.004
16	0	0
17	0	0
18	0	0.004
19	0	0
20	0	0.004

38. During the past six months how many days were you so sick that you were unable to carry on your usual activities - such as going to work or working around the house?

	AA	MA
0	0.789916	0.872
1	0.117647	0.084
2	0.05042	0.016
3	0.033613	0.016
4	0.008403	0.012

39. How many days in the past six months were you in a hospital for physical health problems?

	AA	MA
0	0.855932	0.94
1	0.033898	0.02
2	0.050847	0.016
3	0.008475	0
4	0.016949	0.008
5	0.008475	0.008
6	0.016949	0
7	0	0.008
15	0.008475	0

40. How many days in the past six months were you in a nursing home, or rehabilitation center for physical health problems?

	AA	MA
0	0.983193	0.975904
1	0	0.004016
2	0	0.004016
3	0	0.004016
4	0	0.008032
5	0	0.004016
6	0	0

7	0.008403	0
10	0.008403	0

42. Amount of prescription medication taken in the past month?

	AA	MA
0	0.168067	0.204
1	0.193277	0.372
2	0.176471	0.2
3	0.142857	0.112
4	0.134454	0.04
5	0.07563	0.028
6	0.05042	0.012
7	0.042017	0.02
8	0	0.004
9	0.008403	0
10	0	0.008
11	0.008403	0

Chapter 6

DISCUSSION AND CONCLUSIONS

The results indicate that ethnicity as a function of age does affect anthropometry. Ethnic effect was found to be significant in some upper reach anthropometric measurements including height, vertical reach distance, horizontal distance from buttock to hand, rotation of head to right, rotation of head to left, flexion of head, extension of head, lateral rotation of the shoulder, medial rotation of the shoulder, abduction and adduction of shoulder, and extension of shoulder at 5 % alpha levels.

In comparing all the anthropometric measurements, the indicated changes in anthropometric measurements illustrate a varying rate of decline between older Anglo Americans and older Mexican Americans. The overall trend in all the measured reach capabilities indicates Anglo Americans have higher reach capabilities than Mexican Americans. By subgroups, Anglo American males exhibited higher reach averages than Mexican American males. In most cases, both male subgroups recorded higher reach measurements than both female subgroups possibly indicating that gender has a greater effect on upper extremity reach measurements. Female Anglo Americans also generally had higher reach capabilities than their Mexican American counterpart. However, in rotation of head to the left and right, extension and flexion of head, and medial rotation of the shoulder, Mexican Americans including both male and female subgroups had higher reaches than Anglo Americans including all sub groups (male and female). I viewed the aforementioned reach variables as close range reach indicators in that they were peculiar to between shoulder to shoulder activities. Based on the report from the

OARS questionnaire, Anglo Americans reported greater levels of difficulty or need of assistance in performing such activities as using the telephone, preparing their own meal, taking their own medicine, handling their money, and using the shower. In contrast, Anglo American had higher measurements in lateral rotation of shoulder, lower and upper hand height, and vertical reach distances all corresponding to typical posture which shopping for groceries. The Anglo Americans did report lesser difficulty in shopping for groceries. The results show that older Anglo American have different reach capabilities than older Mexican Americans and correlation of results convey that upper extremity reach capability measurements could serve as reliable predictors of difficulty level in performing activities of daily living. The fact that the older Mexican Americans had increased degrees of mobility can experienced less difficulty in performing close range activities but had greater difficulties in performing activities that required extended reaches suggests that the older Mexican Americans are disadvantaged in terms of range of motion abilities in comparison to their Anglo American counterparts.

Appendix

Multivariate Tests^b

Effect		Value	F	Hypothesis df	Error df
Intercept	Pillai's Trace	.882	121.928 ^a	21.000	342.000
	Wilks' Lambda	.118	121.928 ^a	21.000	342.000
	Hotelling's Trace	7.487	121.928 ^a	21.000	342.000
	Roy's Largest Root	7.487	121.928 ^a	21.000	342.000
Age	Pillai's Trace	.217	4.512 ^a	21.000	342.000
	Wilks' Lambda	.783	4.512 ^a	21.000	342.000
	Hotelling's Trace	.277	4.512 ^a	21.000	342.000
	Roy's Largest Root	.277	4.512 ^a	21.000	342.000
Gender	Pillai's Trace	.495	15.979 ^a	21.000	342.000
	Wilks' Lambda	.505	15.979 ^a	21.000	342.000
	Hotelling's Trace	.981	15.979 ^a	21.000	342.000
	Roy's Largest Root	.981	15.979 ^a	21.000	342.000
Ethnicity	Pillai's Trace	.956	355.201 ^a	21.000	342.000
	Wilks' Lambda	.044	355.201 ^a	21.000	342.000
	Hotelling's Trace	21.811	355.201 ^a	21.000	342.000
	Roy's Largest Root	21.811	355.201 ^a	21.000	342.000

Gender * Ethnicity	Pillai's Trace	.035	.588 ^a	21.000	342.000
	Wilks' Lambda	.965	.588 ^a	21.000	342.000
	Hotelling's Trace	.036	.588 ^a	21.000	342.000
	Roy's Largest Root	.036	.588 ^a	21.000	342.000

a. Exact statistic

b. Design: Intercept + Age + Gender + Ethnicity + Gender * Ethnicity

Multivariate Tests^b

Effect		Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.000	.882
	Wilks' Lambda	.000	.882
	Hotelling's Trace	.000	.882
	Roy's Largest Root	.000	.882
Age	Pillai's Trace	.000	.217
	Wilks' Lambda	.000	.217
	Hotelling's Trace	.000	.217
	Roy's Largest Root	.000	.217
Gender	Pillai's Trace	.000	.495
	Wilks' Lambda	.000	.495
	Hotelling's Trace	.000	.495
	Roy's Largest Root	.000	.495

Ethnicity	Pillai's Trace	.000	.956
	Wilks' Lambda	.000	.956
	Hotelling's Trace	.000	.956
	Roy's Largest Root	.000	.956
Gender * Ethnicity	Pillai's Trace	.926	.035
	Wilks' Lambda	.926	.035
	Hotelling's Trace	.926	.035
	Roy's Largest Root	.926	.035

b. Design: Intercept + Age + Gender + Ethnicity + Gender * Ethnicity

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Height	18356.321 ^a	4	4589.080	90.316	.000	.499
	O.F.R.	23687.180 ^b	4	5921.795	42.619	.000	.320
	O.G.R.	24486.847 ^c	4	6121.712	46.312	.000	.339
	Arm Span	17108.378 ^d	4	4277.095	31.462	.000	.258
	U.H.H.	31595.661 ^e	4	7898.915	1.944	.103	.021
	L.H.H.	16133.251 ^f	4	4033.313	1.987	.096	.021

	V.R.D.	4803.537 ^g	4	1200.884	3.358	.010	.036
	H.D.F.B.H.	8908.324 ^h	4	2227.081	13.325	.000	.128
	F.F.R	3293.862 ⁱ	4	823.465	16.838	.000	.157
	F.G.R	3851.549 ^j	4	962.887	22.366	.000	.198
	R.H.R	4025.674 ^k	4	1006.419	10.840	.000	.107
	R.H.L	2959.674 ^l	4	739.918	6.160	.000	.064
	F.H	38713.236 ^m	4	9678.309	157.636	.000	.635
	E.H	64106.277 ⁿ	4	16026.569	207.436	.000	.696
	L.R.S	3723.688 ^o	4	930.922	5.408	.000	.056
	M.R.S.	35959.482 ^p	4	8989.870	59.585	.000	.397
	Ab. S.	1.002E6	4	250544.314	581.943	.000	.865
	Ad. S	715030.123 ^r	4	178757.531	736.588	.000	.891
	F.S	8919.132 ^s	4	2229.783	5.711	.000	.059
	E.S	6942.828 ^t	4	1735.707	11.197	.000	.110
	F.E	7455.010 ^u	4	1863.752	8.582	.000	.087
Intercept	Height	101680.175	1	101680.175	2001.127	.000	.847
	O.F.R.	154438.971	1	154438.971	1111.500	.000	.754
	O.G.R.	150302.028	1	150302.028	1137.063	.000	.759
	Arm Span	99510.287	1	99510.287	731.990	.000	.669
	U.H.H.	142286.623	1	142286.623	35.015	.000	.088
	L.H.H.	42470.430	1	42470.430	20.918	.000	.055

	V.R.D.	674.324	1	674.324	1.886	.171	.005
	H.D.F.B.H.	32480.637	1	32480.637	194.336	.000	.349
	F.F.R	27666.084	1	27666.084	565.692	.000	.610
	F.G.R	22856.855	1	22856.855	530.915	.000	.595
	R.H.R	17819.325	1	17819.325	191.933	.000	.346
	R.H.L	15811.046	1	15811.046	131.627	.000	.267
	F.H	2718.119	1	2718.119	44.271	.000	.109
	E.H	6355.028	1	6355.028	82.255	.000	.185
	L.R.S	12847.957	1	12847.957	74.644	.000	.171
	M.R.S.	12146.693	1	12146.693	80.508	.000	.182
	Ab. S.	35630.257	1	35630.257	82.759	.000	.186
	Ad. S	21423.317	1	21423.317	88.277	.000	.196
	F.S	106295.417	1	106295.417	272.229	.000	.429
	E.S	10913.601	1	10913.601	70.402	.000	.163
	F.E	91409.574	1	91409.574	420.911	.000	.538
Age	Height	1252.457	1	1252.457	24.649	.000	.064
	O.F.R.	2028.546	1	2028.546	14.599	.000	.039
	O.G.R.	3511.004	1	3511.004	26.561	.000	.068
	Arm Span	1051.290	1	1051.290	7.733	.006	.021
	U.H.H.	4752.398	1	4752.398	1.170	.280	.003
	L.H.H.	971.521	1	971.521	.478	.490	.001

	V.R.D.	1673.630	1	1673.630	4.680	.031	.013
	H.D.F.B.H.	1898.740	1	1898.740	11.360	.001	.030
	F.F.R	254.647	1	254.647	5.207	.023	.014
	F.G.R	237.265	1	237.265	5.511	.019	.015
	R.H.R	2232.539	1	2232.539	24.047	.000	.062
	R.H.L	1393.609	1	1393.609	11.602	.001	.031
	F.H	.274	1	.274	.004	.947	.000
	E.H	85.299	1	85.299	1.104	.294	.003
	L.R.S	127.713	1	127.713	.742	.390	.002
	M.R.S.	16.800	1	16.800	.111	.739	.000
	Ab. S.	1373.342	1	1373.342	3.190	.075	.009
	Ad. S	94.956	1	94.956	.391	.532	.001
	F.S	6868.174	1	6868.174	17.590	.000	.046
	E.S	.505	1	.505	.003	.955	.000
	F.E	5646.410	1	5646.410	26.000	.000	.067
Gender	Height	14984.598	1	14984.598	294.906	.000	.449
	O.F.R.	19901.994	1	19901.994	143.235	.000	.284
	O.G.R.	18779.036	1	18779.036	142.067	.000	.282
	Arm Span	13890.547	1	13890.547	102.178	.000	.220
	U.H.H.	3954.766	1	3954.766	.973	.325	.003
	L.H.H.	13538.405	1	13538.405	6.668	.010	.018

	V.R.D.	1306.298	1	1306.298	3.653	.057	.010
	H.D.F.B.H.	1656.311	1	1656.311	9.910	.002	.027
	F.F.R	2781.843	1	2781.843	56.881	.000	.136
	F.G.R	3413.274	1	3413.274	79.283	.000	.180
	R.H.R	.348	1	.348	.004	.951	.000
	R.H.L	.045	1	.045	.000	.985	.000
	F.H	7.047	1	7.047	.115	.735	.000
	E.H	33.217	1	33.217	.430	.512	.001
	L.R.S	467.548	1	467.548	2.716	.100	.007
	M.R.S.	190.309	1	190.309	1.261	.262	.003
	Ab. S.	54.232	1	54.232	.126	.723	.000
	Ad. S	468.359	1	468.359	1.930	.166	.005
	F.S	218.190	1	218.190	.559	.455	.002
	E.S	883.619	1	883.619	5.700	.017	.016
	F.E	397.790	1	397.790	1.832	.177	.005
Ethnicity	Height	944.567	1	944.567	18.590	.000	.049
	O.F.R.	282.447	1	282.447	2.033	.155	.006
	O.G.R.	25.008	1	25.008	.189	.664	.001
	Arm Span	518.893	1	518.893	3.817	.052	.010
	U.H.H.	12402.027	1	12402.027	3.052	.081	.008
	L.H.H.	1784.456	1	1784.456	.879	.349	.002

V.R.D.	1674.546	1	1674.546	4.682	.031	.013
H.D.F.B.H.	3894.709	1	3894.709	23.303	.000	.060
F.F.R	23.109	1	23.109	.473	.492	.001
F.G.R	74.381	1	74.381	1.728	.190	.005
R.H.R	1363.187	1	1363.187	14.683	.000	.039
R.H.L	1237.682	1	1237.682	10.304	.001	.028
F.H	37879.889	1	37879.889	616.969	.000	.630
E.H	62060.661	1	62060.661	803.268	.000	.689
L.R.S	2968.484	1	2968.484	17.246	.000	.045
M.R.S.	35030.389	1	35030.389	232.182	.000	.391
Ab. S.	970163.197	1	970163.197	2253.413	.000	.862
Ad. S	698021.723	1	698021.723	2876.269	.000	.888
F.S	1045.955	1	1045.955	2.679	.103	.007
E.S	5531.888	1	5531.888	35.685	.000	.090
F.E	648.454	1	648.454	2.986	.085	.008
Gender * Ethnicity Height	13.977	1	13.977	.275	.600	.001
O.F.R.	104.163	1	104.163	.750	.387	.002
O.G.R.	23.811	1	23.811	.180	.672	.000
Arm Span	.417	1	.417	.003	.956	.000
U.H.H.	6346.045	1	6346.045	1.562	.212	.004
L.H.H.	4764.881	1	4764.881	2.347	.126	.006

	V.R.D.	126.393	1	126.393	.353	.553	.001
	H.D.F.B.H.	41.639	1	41.639	.249	.618	.001
	F.F.R	49.936	1	49.936	1.021	.313	.003
	F.G.R	55.838	1	55.838	1.297	.256	.004
	R.H.R	.816	1	.816	.009	.925	.000
	R.H.L	2.124	1	2.124	.018	.894	.000
	F.H	4.627	1	4.627	.075	.784	.000
	E.H	47.674	1	47.674	.617	.433	.002
	L.R.S	85.020	1	85.020	.494	.483	.001
	M.R.S.	11.600	1	11.600	.077	.782	.000
	Ab. S.	68.359	1	68.359	.159	.691	.000
	Ad. S	41.550	1	41.550	.171	.679	.000
	F.S	30.955	1	30.955	.079	.778	.000
	E.S	11.877	1	11.877	.077	.782	.000
	F.E	72.562	1	72.562	.334	.564	.001
Error	Height	18393.749	362	50.811			
	O.F.R.	50298.603	362	138.946			
	O.G.R.	47850.764	362	132.184			
	Arm Span	49212.015	362	135.945			
	U.H.H.	1471024.098	362	4063.602			
	L.H.H.	734987.783	362	2030.353			

	V.R.D.	129463.571	362	357.634			
	H.D.F.B.H.	60503.410	362	167.136			
	F.F.R	17704.192	362	48.907			
	F.G.R	15584.757	362	43.052			
	R.H.R	33608.511	362	92.841			
	R.H.L	43483.432	362	120.120			
	F.H	22225.614	362	61.397			
	E.H	27968.202	362	77.260			
	L.R.S	62308.841	362	172.124			
	M.R.S.	54616.726	362	150.875			
	Ab. S.	155852.057	362	430.531			
	Ad. S	87851.267	362	242.683			
	F.S	141347.707	362	390.463			
	E.S	56117.031	362	155.019			
	F.E	78615.906	362	217.171			
Total	Height	9561545.920	367				
	O.F.R.	1.449E7	367				
	O.G.R.	1.295E7	367				
	Arm Span	9579842.600	367				
	U.H.H.	1.263E7	367				
	L.H.H.	4328512.740	367				

	V.R.D.	638423.200	367				
	H.D.F.B.H.	2381319.350	367				
	F.F.R	2727200.550	367				
	F.G.R	2210203.870	367				
	R.H.R	961445.000	367				
	R.H.L	1013392.000	367				
	F.H	482882.000	367				
	E.H	841834.000	367				
	L.R.S	1270301.000	367				
	M.R.S.	1608307.000	367				
	Ab. S.	5299681.000	367				
	Ad. S	2192382.000	367				
	F.S	7325558.000	367				
	E.S	1412004.000	367				
	F.E	6340741.000	367				
Corrected Total	Height	36750.070	366				
	O.F.R.	73985.783	366				
	O.G.R.	72337.611	366				
	Arm Span	66320.393	366				
	U.H.H.	1502619.758	366				
	L.H.H.	751121.034	366				

V.R.D.	134267.108	366				
H.D.F.B.H.	69411.735	366				
F.F.R	20998.054	366				
F.G.R	19436.306	366				
R.H.R	37634.185	366				
R.H.L	46443.106	366				
F.H	60938.850	366				
E.H	92074.480	366				
L.R.S	66032.529	366				
M.R.S.	90576.207	366				
Ab. S.	1158029.313	366				
Ad. S	802881.390	366				
F.S	150266.839	366				
E.S	63059.858	366				
F.E	86070.916	366				

- a. R Squared = .499 (Adjusted R Squared = .494)
- b. R Squared = .320 (Adjusted R Squared = .313)
- c. R Squared = .339 (Adjusted R Squared = .331)
- d. R Squared = .258 (Adjusted R Squared = .250)
- e. R Squared = .021 (Adjusted R Squared = .010)
- f. R Squared = .021 (Adjusted R Squared = .011)
- g. R Squared = .036 (Adjusted R Squared = .025)
- h. R Squared = .128 (Adjusted R Squared = .119)
- i. R Squared = .157 (Adjusted R Squared = .148)
- j. R Squared = .198 (Adjusted R Squared = .189)
- k. R Squared = .107 (Adjusted R Squared = .097)
- l. R Squared = .064 (Adjusted R Squared = .053)
- m. R Squared = .635 (Adjusted R Squared = .631)
- n. R Squared = .696 (Adjusted R Squared = .693)
- o. R Squared = .056 (Adjusted R Squared = .046)
- p. R Squared = .397 (Adjusted R Squared = .390)
- q. R Squared = .865 (Adjusted R Squared = .864)
- r. R Squared = .891 (Adjusted R Squared = .889)
- s. R Squared = .059 (Adjusted R Squared = .049)
- t. R Squared = .110 (Adjusted R Squared = .100)
- u. R Squared = .087 (Adjusted R Squared = .077)

Parameter Estimates

Dependent Variable	Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
						Lower Bound	Upper Bound	
Height	Intercept	186.913	4.066	45.970	.000	178.917	194.909	.854
	Age	-.268	.054	-4.965	.000	-.374	-.162	.064
	[Gender=F]	-13.306	.905	-14.695	.000	-15.087	-11.525	.374
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	3.883	1.178	3.296	.001	1.566	6.200	.029
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-.838	1.599	-.524	.600	-3.982	2.305	.001
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
O.F.R.	Intercept	230.681	6.724	34.309	.000	217.458	243.903	.765
	Age	-.341	.089	-3.821	.000	-.516	-.165	.039
	[Gender=F]	-14.673	1.497	-9.800	.000	-17.618	-11.729	.210
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	3.039	1.948	1.560	.120	-.793	6.870	.007

	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-2.289	2.644	-.866	.387	-7.488	2.910	.002
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
O.G.R.	Intercept	228.394	6.558	34.827	.000	215.497	241.290	.770
	Age	-.449	.087	-5.154	.000	-.620	-.277	.068
	[Gender=F]	-14.818	1.460	-10.146	.000	-17.690	-11.946	.221
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	1.111	1.900	.584	.559	-2.627	4.848	.001
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-1.094	2.579	-.424	.672	-6.165	3.976	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
Arm Span	Intercept	185.399	6.651	27.877	.000	172.321	198.478	.682
	Age	-.245	.088	-2.781	.006	-.419	-.072	.021

	[Gender=F]	-13.287	1.481	-8.971	.000	-16.200	-10.375	.182
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	2.495	1.927	1.295	.196	-1.295	6.285	.005
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	.145	2.615	.055	.956	-4.998	5.287	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
U.H.H.	Intercept	217.002	36.361	5.968	.000	145.497	288.507	.090
	Age	-.522	.483	-1.081	.280	-1.471	.427	.003
	[Gender=F]	-15.984	8.097	-1.974	.049	-31.908	-.061	.011
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	3.619	10.537	.343	.731	-17.103	24.341	.000
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	17.866	14.297	1.250	.212	-10.249	45.981	.004
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.

	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
L.H.H.	Intercept	117.891	25.702	4.587	.000	67.347	168.435	.055
	Age	-.236	.341	-.692	.490	-.907	.435	.001
	[Gender=F]	-5.305	5.724	-.927	.355	-16.561	5.950	.002
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	12.502	7.448	1.678	.094	-2.146	27.149	.008
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-15.481	10.106	-1.532	.126	-35.355	4.392	.006
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
V.R.D.	Intercept	13.910	10.787	1.290	.198	-7.303	35.123	.005
	Age	.310	.143	2.163	.031	.028	.591	.013
	[Gender=F]	-2.792	2.402	-1.162	.246	-7.516	1.932	.004
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	5.873	3.126	1.879	.061	-.275	12.020	.010
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-2.521	4.241	-.594	.553	-10.862	5.819	.001

[Gender=F] * [Ethnicity=MA]		0 ^a	.	.	.	.	.	.
[Gender=M] * [Ethnicity=AA]		0 ^a	.	.	.	.	.	.
[Gender=M] * [Ethnicity=MA]		0 ^a	.	.	.	.	.	.
H.D.F.B.H Intercept		109.020	7.374	14.784	.000	94.519	123.522	.376
Age		-.330	.098	-3.371	.001	-.522	-.137	.030
[Gender=F]		-5.287	1.642	-3.219	.001	-8.516	-2.057	.028
[Gender=M]		0 ^a	.	.	.	.	.	.
[Ethnicity=AA]		-7.758	2.137	-3.630	.000	-11.960	-3.555	.035
[Ethnicity=MA]		0 ^a	.	.	.	.	.	.
[Gender=F] * [Ethnicity=AA]		1.447	2.899	.499	.618	-4.255	7.149	.001
[Gender=F] * [Ethnicity=MA]		0 ^a	.	.	.	.	.	.
[Gender=M] * [Ethnicity=AA]		0 ^a	.	.	.	.	.	.
[Gender=M] * [Ethnicity=MA]		0 ^a	.	.	.	.	.	.
F.F.R Intercept		97.762	3.989	24.508	.000	89.918	105.607	.624
Age		-.121	.053	-2.282	.023	-.225	-.017	.014
[Gender=F]		-5.121	.888	-5.765	.000	-6.868	-3.374	.084
[Gender=M]		0 ^a	.	.	.	.	.	.

	[Ethnicity=AA]	.251	1.156	.217	.828	-2.023	2.524	.000
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-1.585	1.568	-1.010	.313	-4.669	1.500	.003
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
F.G.R	Intercept	88.657	3.743	23.688	.000	81.297	96.017	.608
	Age	-.117	.050	-2.348	.019	-.214	-.019	.015
	[Gender=F]	-5.713	.833	-6.854	.000	-7.352	-4.074	.115
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	1.810	1.085	1.669	.096	-.323	3.943	.008
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-1.676	1.472	-1.139	.256	-4.570	1.218	.004
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
R.H.R	Intercept	78.250	5.496	14.238	.000	67.442	89.058	.359

	Age	-.358	.073	-4.904	.000	-.501	-.214	.062
	[Gender=F]	.035	1.224	.029	.977	-2.372	2.442	.000
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-4.060	1.593	-2.549	.011	-7.192	-.928	.018
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-.203	2.161	-.094	.925	-4.452	4.047	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
R.H.L	Intercept	73.654	6.252	11.782	.000	61.360	85.948	.277
	Age	-.283	.083	-3.406	.001	-.446	-.119	.031
	[Gender=F]	.187	1.392	.134	.893	-2.551	2.925	.000
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-3.802	1.812	-2.098	.037	-7.365	-.239	.012
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-.327	2.458	-.133	.894	-5.161	4.507	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.

	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
F.H	Intercept	40.993	4.469	9.172	.000	32.204	49.782	.189
	Age	.004	.059	.067	.947	-.113	.121	.000
	[Gender=F]	-.539	.995	-.541	.589	-2.496	1.418	.001
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-22.178	1.295	-17.123	.000	-24.725	-19.631	.447
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	.482	1.757	.275	.784	-2.973	3.938	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
E.H	Intercept	58.827	5.014	11.733	.000	48.967	68.686	.276
	Age	-.070	.067	-1.051	.294	-.201	.061	.003
	[Gender=F]	1.420	1.117	1.272	.204	-.775	3.616	.004
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-27.304	1.453	-18.792	.000	-30.161	-24.447	.494
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.

	[Gender=F] * [Ethnicity=AA]	-1.549	1.971	-.786	.433	-5.425	2.328	.002
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
L.R.S	Intercept	60.926	7.483	8.142	.000	46.210	75.643	.155
	Age	-.086	.099	-.861	.390	-.281	.110	.002
	[Gender=F]	1.390	1.667	.834	.405	-1.887	4.668	.002
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	5.107	2.169	2.355	.019	.842	9.372	.015
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	2.068	2.942	.703	.483	-3.718	7.854	.001
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
M.R.S.	Intercept	72.485	7.006	10.346	.000	58.707	86.263	.228
	Age	-.031	.093	-.334	.739	-.214	.152	.000
	[Gender=F]	1.929	1.560	1.236	.217	-1.140	4.997	.004

	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-20.713	2.030	-10.202	.000	-24.706	-16.720	.223
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-.764	2.755	-.277	.782	-6.181	4.654	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
Ab. S.	Intercept	163.189	11.835	13.788	.000	139.914	186.463	.344
	Age	-.281	.157	-1.786	.075	-.589	.028	.009
	[Gender=F]	.101	2.636	.038	.969	-5.082	5.285	.000
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-110.089	3.430	-32.097	.000	-116.833	-103.344	.740
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-1.854	4.654	-.398	.691	-11.006	7.297	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.

Ad. S	Intercept	35.602	8.886	4.007	.000	18.127	53.076	.042
	Age	-.074	.118	-.626	.532	-.306	.158	.001
	[Gender=F]	1.704	1.979	.861	.390	-2.188	5.595	.002
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	93.444	2.575	36.288	.000	88.380	98.508	.784
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	1.446	3.494	.414	.679	-5.425	8.316	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
F.S	Intercept	186.759	11.271	16.570	.000	164.594	208.924	.431
	Age	-.627	.150	-4.194	.000	-.922	-.333	.046
	[Gender=F]	2.280	2.510	.908	.364	-2.656	7.216	.002
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-3.021	3.266	-.925	.356	-9.445	3.402	.002
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-1.248	4.432	-.282	.778	-9.963	7.467	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.

	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
E.S	Intercept	65.288	7.102	9.193	.000	51.322	79.254	.189
	Age	-.005	.094	-.057	.955	-.191	.180	.000
	[Gender=F]	-2.946	1.582	-1.863	.063	-6.057	.164	.009
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-7.997	2.058	-3.885	.000	-12.044	-3.949	.040
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=F] * [Ethnicity=AA]	-.773	2.792	-.277	.782	-6.264	4.718	.000
	[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
	[Gender=M] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
F.E	Intercept	172.395	8.406	20.509	.000	155.865	188.925	.537
	Age	-.569	.112	-5.099	.000	-.788	-.349	.067
	[Gender=F]	3.191	1.872	1.705	.089	-.490	6.873	.008
	[Gender=M]	0 ^a	.	.	.	.	.	.
	[Ethnicity=AA]	-1.915	2.436	-.786	.432	-6.705	2.876	.002
	[Ethnicity=MA]	0 ^a	.	.	.	.	.	.

[Gender=F] * [Ethnicity=AA]	-1.910	3.305	-.578	.564	-8.410	4.589	.001
[Gender=F] * [Ethnicity=MA]	0 ^a	.	.	.	.	.	.
[Gender=M] * [Ethnicity=AA]	0 ^a	.	.	.	.	.	.
[Gender=M] * [Ethnicity=MA]	0 ^a

a. This parameter is set to zero because it is redundant.

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CURRICULUM VITA

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Education:

The University of Texas at El Paso (UTEP)

Industrial Engineering, M.S

August, 2009

North Carolina State University (NCSU)

Industrial and Systems Engineering, B.S

August, 2008

Certifications/ Training:

- Lean Manufacturing
- ASQ Certified Six Sigma Green Belt
- Systems Engineering

Relevant Experience:

Duke University Occupational and Environmental Safety Office, Durham, NC

Mar 08 - Aug 08

Position: Ergonomics Division Intern

- Assisted Ergonomists with evaluations of various work sites , specializing in redesign plans to improve material handling flow and decrease risk of musculoskeletal disorders.

Fine Line Prototyping, Raleigh, NC

Oct 06 - Aug 08

Position: Stereolithography Weekend Supervisor

- Received electronic data (CAD files) from customers and used SLA machines to build 3-dimensional parts for customers. In addition, coordinated shift of 6-8 employees and verified cleaned Rapid Prototype models met appropriate quality standards.

Del Laboratories, Rocky Point, NC

May 07 – Aug 07

Position: Production Analyst (Summer Internship)

- In addition to performing time studies, I reported fill weights, production staffing, line speeds and resolved discrepancies in the production waste data report.
- I also helped design and implement a database system to track future audits along with an alert function to notify management of major waste issues.

Revlon, Oxford, NC

May 06 – Aug 06**Position:** Overall Equipment Efficiency (OEE) Team Leader (Summer Internship)

- Successfully completed consolidation project that eventually combined two product lines into one whole project function.
- Implemented process improvement methodologies while working with cross functional teams, all of whom aided to raise the OEE to exceed a specified target. The two lines I was responsible for broke OEE line records in consecutive months during my tenure.

Honors and Activities:

- National Recipient of the Prudential Spirit of Community Service Award
- 2009 Recipient of the National Society of Black Engineers (NSBE) Board of Corporate Affiliates Scholar Award
- UTEP NSBE chapter Vice President, 2008-2009