PHOTO-ANTHROPOMETRY OF ADULT EGYPTIAN HAND

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ABSTRACT

Anthropometry is the branch of science dealing with body measurements, its roots dating back since ancient times. It finds its way to many disciplines including medicine, industry, and forensic sciences. Hand anthropometry is an important player in medical diagnosis, manual tools design, and personal identification. **Objective**: Developing a new technique for Photo-Anthropometry based on hand photos, and to apply this technique on a sample of adult Egyptians. **Methodology**: Development of a software based on a new technique for Photo-Anthropometry, and testing the software for twenty one hand measurements carried on photos of the right hand of 113 adult Egyptians volunteers (58 males, 55 females) from three different geographical areas (Kafr El-Sheikh, Giza, and Fayoum). **Results**: The new method is simple, easy, and accurate, as the photo is calibrated to overcome the magnification problem common in photo-anthropometry. The accuracy of the measurements was 0.397%. The new system have a unique feature as it can locate calculated points based on simple landmarks. However the proposed method apply only in co-planner measurements. The mean, standard deviation, and percentiles were calculated for the twenty one hand measurements. In addition, two predictive polynomial equations calculating percentiles of hand length and hand width were developed, as well as sex differences were reported. **Conclusion**: The new developed method is accurate and easy to use which enable absolute measurements on hand photos.

KEYWORDS: Hand, Anthropometry, Percentiles, Photo, Egypt

INTRODUCTION

Anthropometry have many different definitions, one of the simplest definition "*Anthropometry is the measurement of the size and proportions of the human body*" (**McLorg, 2006)**. The Britannica defined it as "*the systematic collection of the human* *body*" **(The Editors of Encyclopaedia Britannica, 2019)**. The German Anatomist Johann Elsholtz publish his work "*Anthropometria"* on body measurements in 1654 **(Contributors, 2019)**, however body proportions were identified by artists long before.

Peeking to the past, one will find out the Ancient Egyptians, Greeks, and Romans had previously recognized body proportions and it's normal variations. The statue of Seneb sculptured at the time of the old Kingdom reflects Ancient Egyptian awareness of abnormal body proportions **(Contributors, Seneb, 2019).** Canon of Polykleitos were stated for sculpture proportions based on hand length during the Greek era **(Tobin, 1975)**. Markus Vitruvius Pollio, a Roman architect in his book "De archtectura" mentioned different body proportions **(Vitruvius, 1521),** later Leonardo da Vinci in the Renaissance period redraw the ideal man based on Vitruvius' proportions **(Vinci, 1487).**

In 1890 Francis Galton discussed the benefits of measurements of mankind and emphasize the importance of quantitative and absolute measurements, as comparing an individual with his peers or with himself at different time may help assessment of health, so anthropometry started to be an applied science in health **(Galton, 1890).** Anthropometric measurements started to be applied in many applications in different domains including clinical medicine **(Kolar, Ferkas, & Munro, 1985),** industry **(Qutubuddin, Hebbal, & Kumar, 2012) (Ching-yi & Deng-chuan, 2017)**, architecture **(Dempster, 1955)**, and forensics **(Krishan, 2006).**

In medicine anthropometry play a key role in diagnosing growth abnormalities, normal growth curves, e.g. for weight and height are used in evaluating child health **(Kuczmarski, et al., 2002)**. Industry make use of anthropometry for manufacturing tools ergonomically **(Qutubuddin, Hebbal, & Kumar, 2012).** Architecture is one of the first fields recognized the importance of anthropometric measurements even before the term “Anthropometry” was coined **(Vitruvius, 1521)**.

Anthropometry finds its way to forensic sciences since 1882 in which human skeletal remains are used in personal identification, then used in sex **(Sangeeta & Kapoor, 2015),** race determination, and stature estimation **(Krishan, 2006) (Manpreet, et al., 2013).**

Anthropometry can be performed directly through set of instruments such as tapes or calipers **(Farkas, 1994)** or indirectly through two **(Ehsanollah, Shiva, & Zadehr, 2013) (Martin & Vigorito, 2012)** or three dimensional images **(Ashley, Kathryn, Josh, Stefan, & Joel, 2010)** or some electrical properties such as bioelectrical impedance for studying body composition **(Ward & Müller, 2013).**

Direct methods have some limitations including operator-subject measurement as the operator can perform measurements for subject during the meeting time only. Soft tissues deformation due to presser exerted by instruments, landmarks identification are another limitations. **(Akbarnejad, Osqueizadeh, Mokhtarinia, & Jafarpisheh, 2017)**

The 3D methods are more accurate, more informative but are expensive, non portable as subjects need to go the facilities in which this machine are operating **(Yueh-Ling & Mao-Jiun, 2011)**.

The 2D methods have problems of magnification, perspective error, and also limited to one plane, wherever it have many advantages including storing images for later measurement **(Akbarnejad, Osqueizadeh, Mokhtarinia, & Jafarpisheh, 2017)**, and the 2D images are easier and cheap to be **obtained (Yueh-Ling & Mao-Jiun, 2011).**

Different approaches are used to reduce magnification error including standardizing subject position and print size **(Farkas, 1994)**, including a scale within the photo, thus measurements can be corrected to represent more accurate **values (Hsien & Arnold, 2014).**

AIM OF THE WORK

Establishing a new measuring technique based on 2D photometry, and preparing a pilot data for the anthropometry of adult Egyptians hand based on the newly developed technique.

SUBJECTS AND METHODS

A sample of 113 healthy Egyptian adults volunteers (58 males, 55 females) living in Cairo, Kafr el-Sheikh, and Fayoum governorates, with mean age 41.4±9.5 years have been included in the study.

For each subject a digital photograph for the palmer side of right hand of each volunteer have been taken, the camera was perpendicular to the palmer plan of the hand. The photo included a ping pong ball of 20 mm radius for calibration. A special software "TracerNET" running under windows operating system was used for measurements. Twenty two landmarks (points) were included in the study as listed in table 1.

Table 1: Landmarks included in the study

Name	Short Name	Description
RtF1B	F1B	Rt Thumb Base
RtF11	F11	Rt Thumb 1st Crease
RtF12	F12	Rt Thumb 2nd Crease
RtF1T	F1T	Rt Thumb Tip
RtF2B	F2B	Rt Index Base
RtF21	F21	Rt Index 1st Crease
RtF22	F22	Rt Index 2nd Crease
RtF2T	F2T	Rt Index Tip
RtF3B	F3B	Rt Middle Base
RtF31	F31	Rt Middle 1st Crease
RtF32	F32	Rt Middle 2nd Crease
RtF3T	F3T	Rt Middle Tip
RtF4B	F4B	Rt Ring Base
RtF41	F41	Rt Ring 1st Crease
RtF42	F42	Rt Ring 2nd Crease
RtF4T	F4T	Rt Ring Tip
RtF5B	F5B	Rt Little Base
RtF51	F51	Rt Little 1st Crease
RtF52	F52	Rt Little 2nd Crease
RtF5T	F5T	Rt Little Tip
RtWristMCrease	WMC	RtWristMedialCrease
RtWristLCrease	WLC	RtWristateralCrease
RtLBP		Rt proximal Lateral border
RtLBD		Rt distal Lateral border
RtMBD		Rt distal Medial border

These landmarks were used to define 21 lines listed in table 2. Figure 1 shows both the landmarks and lines.

Table 2 Lines included in the study

Name	Short Name	Description
RtF1P	F1P	Rt Thumb Proximal phalanx
RtF1M	F1M	Rt Thumb Middle phalanx
RtF1D	F1D	Rt Thumb Distal phalanx
RtF2P	F2P	Rt Index Proximal phalanx
RtF2M	F2M	Rt Index Middle phalanx
RtF2D	F2D	Rt Index Distal phalanx
RtF3P	F3P	Rt Middle Proximal phalanx
RtF3M	F3M	Rt Middle Middle phalanx
RtF3D	F3D	Rt Middle Distal phalanx
RtF4P	F4P	Rt Ring Proximal phalanx
RtF4M	F4M	Rt Ring Middle phalanx
RtF4D	F4D	Rt Ring Distal phalanx
RtF5P	F5P	Rt Little Proximal phalanx
RtF5M	F5M	Rt Little Middle phalanx
RtF5D	F5D	Rt Little Distal phalanx
RtF1	F1L	Rt Thumb Length
RtF2	F2L	Rt Index Length
RtF3	F3L	Rt Middle Length
RtF4	F4L	Rt Ring Length
RtF5	F5L	Rt Little Length
RtWristW	RWW	RtWristWidth
RtHandL	RtL	Rt Hand Length

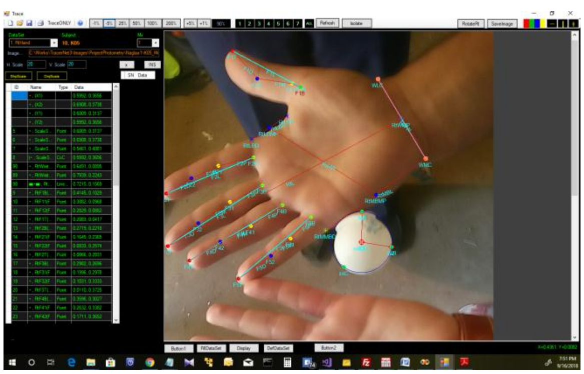

Figure 1 Using ping pong ball for calibration

The ping pong ball have an extremely important function as its diameter projection in the photo is invariant (constant) under rotation as illustrated in figures 2 and 3.

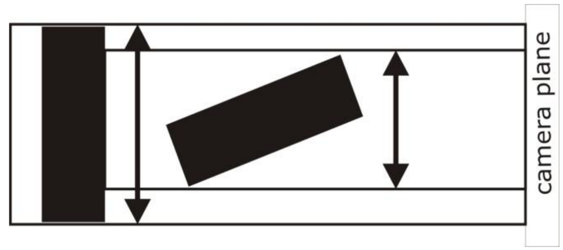

Figure 2 Non spherical scale have different projection length depending on the relation to the camera plane.

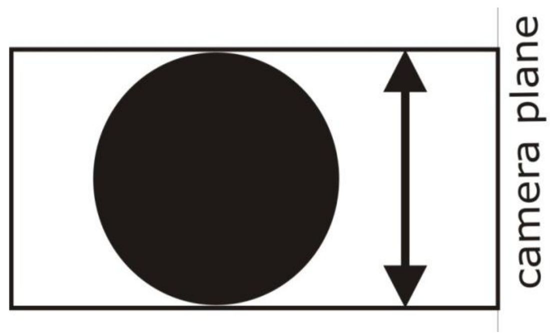

Figure 3 Spherical scale have the same projection regardless of its relation to the camera plane.

Measurements error assessment

To assess the instrumental error of system we measured a known solid object length as shown in the figure 4.

Figure 4 Error assessment with ruler of know length

To assess observational error, 19 measures for 10 hand photos have been measured twice. The error which assessed by square of the difference between each corresponding measures was calculated as follow

$$e = \sqrt{\frac{\sum_1^n (x_1 - x_2)^2}{n}}$$

where n=number of samples (10), x_1 the 1st , x_2 the 2nd measurements

Difference between 1st and 2nd measurements was compared by paired t test. Coefficients of correlation where calculated.

Statistical analysis

Statistical analysis included descriptive statistics, percentiles, paired t test, correlation (Pearson correlation) was done using SPSS ver. 16 and specially developed software.

RESULTS

Instrumental Error

As shown in figure 4, the actual length is 4.00 inches (101.6 mm), the measured length is 101.1964 with total error 0.4036 mm representing 0.00397 of the actual size (0.397%).

Intra-observer error

The results of the paired measurements are shown in table 3 (appendix A). The minimum error was 0.6 mm corresponding to the length of the distal phalanx of the index finger, while the maximum error was 2.36 mm corresponding the hand length. There were no significant difference (assessed by paired t test) among all test variables except for the proximal phalanx length of the ring finger, and hand length and width, the correlation coefficients were positively highly significant for all measurements as shown in table 4.

Table 4 Correlation and paired t test between the 1st and 2nd readings in a set of hand measurements

	Correlation		paired test	
Variable	**r**	**p**	**t**	**p**
F2L	0.98	0.000	0.95	0.367
F2P	0.87	0.001	-0.24	0.815
F2M	0.93	0.000	1.05	0.322
F2D	0.98	0.000	0.19	0.858
F3L	0.98	0.000	0.68	0.513
F3P	0.91	0.000	1.20	0.262
F3M	0.95	0.000	-0.60	0.565
F3D	0.95	0.000	-0.04	0.970
F4L	0.95	0.000	-1.71	0.122
F4P	0.83	0.003	-2.39	0.040
F4M	0.68	0.032	1.51	0.166
F4D	0.96	0.000	0.30	0.772
F5L	0.97	0.000	0.75	0.475
F5P	0.94	0.000	0.93	0.375
F5M	0.84	0.003	-0.28	0.783
F5D	0.97	0.000	0.49	0.635
RWW	0.94	0.000	-0.60	0.560
RtL	0.99	0.000	2.42	0.039
RtHW	0.99	0.000	4.44	0.002

Descriptive statistics for anthropometric measures of the Egyptian Hand

The mean and standard deviation of different measures grouped by gender are listed in table 5.

There were highly significant difference between both sex in all variables except F1P (Thumb Proximal phalanx) as presented in table 6.

The 5th, 10th, 25th, 50th, 75th, 90th,and 95th percentiles are presented in tables 7 and 8 (appendix B and C) for males and females respectively.

Figures 5, 6, 7, and 8 shows the percentiles of females and males hand length, and width.

Table 5 Descriptive statistics for Hand Measurements by sex

	Males		Females	
	Mean	SD	Mean	SD
F1L	69.96	7.59	59.87	6.68
F1P	15.62	4.87	14.09	3.00
F1M	23.21	5.87	19.59	3.49
F1D	33.38	4.75	28.33	4.61
F2L	75.50	8.92	67.84	6.59
F2P	24.95	3.46	22.50	2.55
F2M	24.08	3.26	21.69	2.36
F2D	26.64	4.51	23.77	3.02
F3L	83.31	10.29	74.81	7.35
F3P	28.17	4.43	25.30	3.31
F3M	28.04	3.73	25.32	2.85
F3D	27.22	4.51	24.33	3.31
F4L	76.56	10.73	68.39	6.86
F4P	24.84	4.01	22.17	3.11
F4M	25.13	3.40	22.73	2.80
F4D	26.76	5.33	23.59	3.02
F5L	62.47	8.59	54.36	6.45
F5P	20.08	3.25	17.55	2.38
F5M	18.03	2.54	15.56	2.37
F5D	24.55	4.70	21.44	3.07
RWW	64.67	6.97	56.82	4.51
RtLBL	41.29	7.80	35.03	5.61
RtMBL	76.39	9.40	66.70	8.90
RtL	193.70	17.50	169.39	12.78
RtHW	98.34	7.84	83.32	5.96

Table 6 Unpaired t test for testing the extent of sex difference among the variables

Measure	t	p
F1P	1.933	0.056
F1M	3.828	**0.000**
F1D	5.726	**0.000**
F2L	5.229	**0.000**
F2P	4.31	**0.000**
F2M	4.501	**0.000**
F2D	3.999	**0.000**
F3L	5.06	**0.000**
F3P	3.914	**0.000**
F3M	4.401	**0.000**
F3D	3.887	**0.000**
F4L	4.859	**0.000**
F4P	3.96	**0.000**
F4M	4.102	**0.000**
F4D	3.927	**0.000**
F5L	5.685	**0.000**
F5P	4.731	**0.000**
F5M	5.362	**0.000**
F5D	4.206	**0.000**
RWW	7.163	**0.000**
RtLBL	4.908	**0.000**
RtMBL	5.651	**0.000**
RtL	8.447	**0.000**
RtHW	11.484	**0.000**

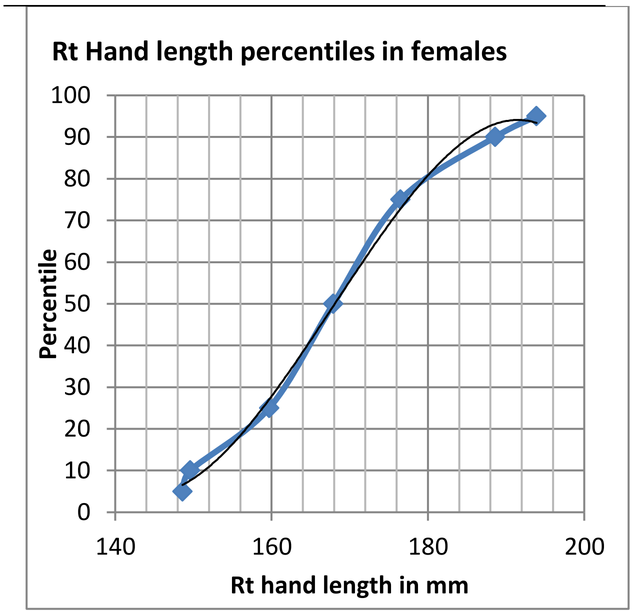

Figure 5 Right hand length percentile for females

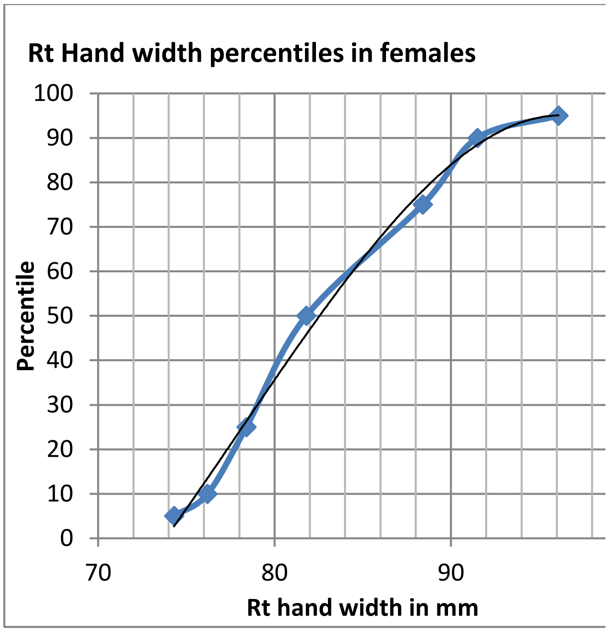

Figure 6 Right hand width percentile for females

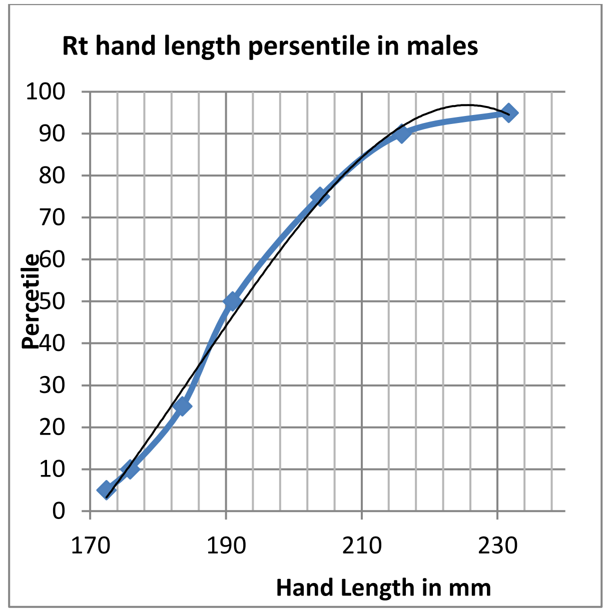

Figure 7 Right hand length percentile for males

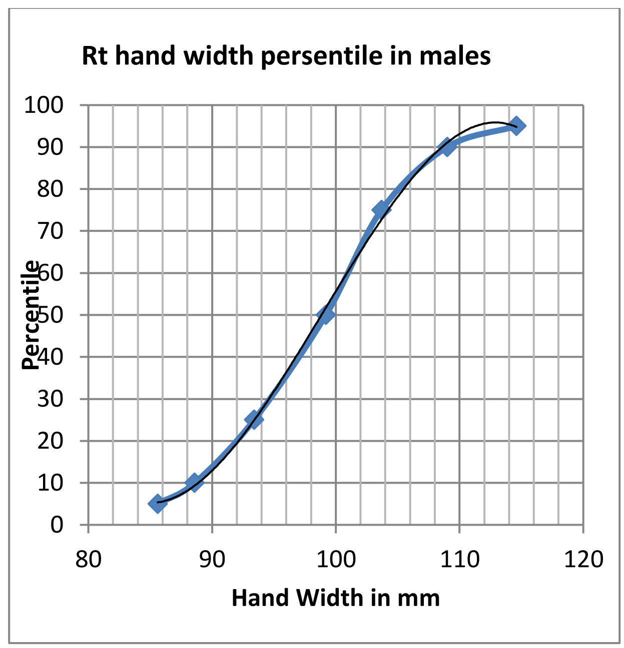

Figure 8 Right hand width percentile for males

The percentile of the female hand length can be calculated by the following equation:

$$\text{hand length percentile} = -0.0016859958x^3 + 0.8487333079x^2 - 139.5761816597x + 7538.2713558410$$

where x represent the hand length, this polynomial model have an R^2 value=0.9965 which is a very good value. While the female hand width can be calculates by the following equation:

$$\text{hand width percentile} = -0.005853103546x^3 + 1.370127909123x^2 - 101.072872753908x + 2349.40250672925$$

where x represent hand width, and $R^2 = 0.9942$, which also have a good predictive values.

The equations for males are

$$\text{hand length percentile} = -0.000482750090x3 + 0.268044692774x2 - 47.229581905292x + 2652.51801666647\ (R^2= 0.9957)$$

$$\text{hand width percentile} = -0.008354061576x3 + 2.480003479265x2 - 240.532057641213x + 7662.86856239361\ (R^2= 0.9988)$$

As an example suppose a female person have a hand length equal 180 mm, so

$$\text{predicted percentile} = -0.0016859958\,(180)^3 + 0.8487333079\,(180)^2 - 139.5761816597\,(180) + 7538.271355841 \approx 81^{st} \text{ percentile}$$

DISCUSSION

Many studies on hand anthropometry were done either direct **(Ching-yi & Deng-chuan, 2017)**, 2D **(Akbarnejad, Osqueizadeh, Mokhtarinia, & Jafarpisheh, 2017)**, and 3D **(Yu, Yick, Ng, & Yip, 2013)** however, in this study, we introduced a two dimensional calibration method using spherical scale (ping pong ball) which minimize the magnification of the photos. Application of this new techniques of digital imaging in photo-anthropometry proved to be beneficial in getting absolute accurate measurements as the instrumental error after the 2D calibration was less than 0.4 %. The system is semi automated in the sense that after locating the landmarks the linear measurements are automatically calculated and saved to a database for further analysis, an important aspect in case of measurements of a large number of individuals. Another unique feature is the ability of the system to locate a derived points, as in our study the hand width was calculated between Right Mid Point of Medial Border (RtMBMP) and Right Mid Point of Lateral Border (RtLBMP), these points are automatically calculated. The 1st one was the midpoint between WMC (wrist medial crease) and RtMDB, while the 2nd point was the midpoint between RtLBP and RtLBD as shown in figure 9.

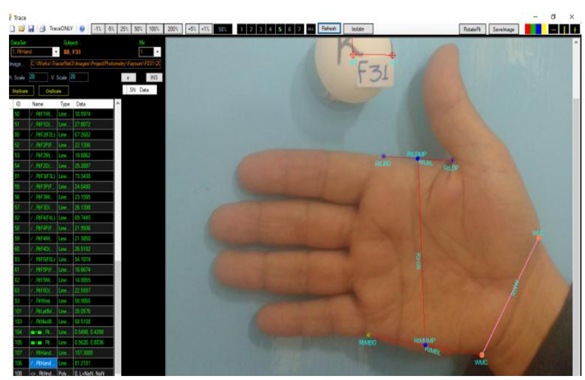

Figure 9 Measuring hand width, the two blue solid points are calculated points.

These technique reduce inter-observer error as this measure depends on 4 simple easy identifiable landmarks.

Another feature is the speed as each hand need less than two minutes to get the 21 measurements, this parameter was not mentioned in all aforementioned studies.

However in spite of the aforementioned advantages there is an important limitation to the developed technique as measurements can be done in one plane only **(Farkas, 1994)** and our developed technique couldn't overcome this limitation.

Comparing the hand length percentile of our study with US army **(Thomas, 1991)** showed that the overall average difference is about -1.95 mm, in which the 5-50 percentiles are bigger in US while 75-95 percentiles are smaller, as shown in Figure 10.

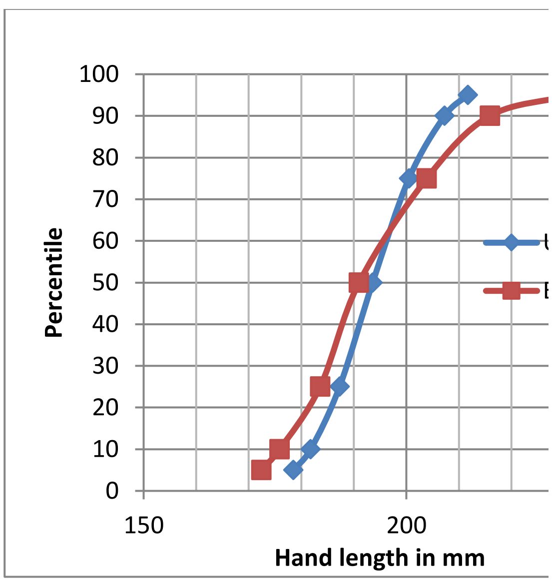

Figure 10 Male hand length percentile in US and Egypt

CONCLUSION

In this study we have introduced as new improved method for hand photo-anthropometry which is easier, faster and more accurate than other photo-anthropometric methods due to the two dimensional calibration. The scope of this new method is limited to the co-planner measurements (lie in one plane), so measurements such as circumferences can't be measured.

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Appendix A

Table 3 Root square error for a set of hand measurements (1st, and 2nd)

	1st Measurements				2nd Measurements				Square difference				
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	√Sq Error
F2L	61.51	79.33	72.12	5.61	60.65	79.10	71.81	5.55	0.05	4.08	1.03	1.17	1.01
F2P	17.50	27.00	22.65	3.00	17.80	26.44	22.77	2.40	0.00	8.76	1.99	2.81	1.41
F2M	20.17	28.03	23.95	2.50	19.95	27.14	23.65	2.16	0.01	2.34	0.88	0.83	0.94
F2D	22.23	29.34	25.68	2.26	21.94	30.52	25.65	2.65	0.00	1.39	0.35	0.47	***0.60***
F3L	68.77	87.08	79.50	5.81	68.86	85.83	79.23	5.55	0.01	9.33	1.56	2.84	1.25
F3P	20.44	30.33	25.84	2.75	21.49	28.91	25.40	2.64	0.02	3.27	1.38	1.29	1.17
F3M	22.21	30.20	27.32	2.38	23.01	30.05	27.48	1.95	0.00	2.09	0.64	0.65	0.80
F3D	22.77	32.03	26.39	2.72	23.10	29.90	26.40	2.15	0.00	4.56	0.82	1.41	0.91
F4L	65.50	78.65	72.66	4.07	65.95	80.45	73.40	4.34	0.08	10.26	2.25	4.02	1.50
F4P	18.54	28.24	22.40	2.77	18.43	28.28	23.64	2.80	0.00	16.02	4.00	6.15	2.00
F4M	23.95	25.94	24.81	0.60	22.50	26.34	24.36	1.23	0.00	2.88	1.00	1.10	1.00
F4D	21.67	30.34	25.58	2.42	22.16	30.44	25.52	2.43	0.00	2.36	0.48	0.72	0.69
F5L	52.81	70.27	61.26	5.38	51.30	69.37	60.93	5.32	0.00	5.74	1.92	1.83	1.39
F5P	14.31	25.37	19.64	3.02	13.35	23.34	19.34	2.95	0.01	4.13	1.00	1.32	1.00
F5M	15.63	19.06	17.44	1.20	14.84	19.69	17.51	1.49	0.02	1.49	0.61	0.56	0.78
F5D	18.58	30.39	24.33	3.11	19.32	28.53	24.19	2.55	0.02	3.43	0.77	1.06	0.88
RWW	56.64	71.51	65.92	4.66	56.59	71.14	66.21	4.56	0.00	7.05	2.23	2.27	1.49
RtL	172.57	205.20	188.46	10.84	170.77	200.86	186.98	10.25	0.05	23.10	5.56	8.28	***2.36***
RtHW	84.16	104.98	96.94	5.96	82.30	104.92	95.71	6.23	0.00	6.96	2.19	2.38	1.48

Appendix B

Table 7 Percentiles for the anthropometric hand measurements for the Egyptian males

	5	10	25	50	75	90	95
F1L	59.6	62.2	66.5	70.2	73.6	79.8	82.9
F1P	9.0	10.6	12.3	14.5	17.6	23.4	26.7
F1M	12.3	15.3	20.5	22.7	26.3	30.3	35.9
F1D	25.9	27.4	30.1	33.4	36.1	39.0	40.2
F2L	61.3	64.4	69.7	75.4	82.1	87.8	91.8
F2P	19.3	20.3	22.4	24.4	27.8	29.9	31.0
F2M	19.2	20.0	21.1	24.8	26.4	28.0	29.0
F2D	20.8	21.2	23.0	26.7	28.8	33.9	37.0
F3L	69.1	71.9	76.6	81.8	90.5	96.0	102.2
F3P	21.6	23.6	25.5	27.8	30.3	33.0	34.1
F3M	22.2	23.1	25.6	27.9	31.1	32.6	36.2
F3D	20.5	21.7	23.9	27.3	30.2	33.5	36.6
F4L	62.0	64.6	69.2	75.2	83.9	88.7	94.1
F4P	19.6	20.8	22.1	24.6	27.2	29.8	31.5
F4M	20.4	20.9	22.4	24.9	28.2	29.6	31.8
F4D	19.6	20.4	23.5	25.8	29.5	33.9	39.4
F5L	48.9	51.5	57.4	62.0	68.2	73.7	79.1
F5P	14.6	15.9	18.6	20.2	22.2	24.4	26.0
F5M	14.6	15.3	16.5	18.2	19.3	21.7	24.4
F5D	17.7	18.6	21.4	24.1	27.1	31.5	33.6
RWW	52.1	56.0	60.1	65.9	70.1	72.8	75.2
RtLBL	27.4	32.2	37.4	41.2	45.9	51.1	56.1
RtMBL	65.5	67.6	70.8	75.7	82.2	88.8	96.8
RtL	172.4	175.9	183.6	191.0	203.9	215.9	231.7
RtHW	85.6	88.6	93.4	99.2	103.7	109.0	114.6

Appendix C

Table 8 Percentiles for the anthropometric hand measurements for the Egyptian females

	5	10	25	50	75	90	95
F1L	51.3	53.3	54.7	60.0	64.3	69.5	75.7
F1P	9.4	10.8	12.1	13.4	15.9	18.3	21.1
F1M	12.1	16.0	18.0	19.6	21.7	23.3	26.0
F1D	21.6	22.1	24.5	28.8	31.7	35.5	37.6
F2L	56.8	59.3	63.6	66.7	71.7	77.4	79.5
F2P	18.2	19.3	20.4	22.2	24.1	26.1	27.4
F2M	16.3	18.1	20.2	21.2	23.1	25.0	25.6
F2D	19.2	20.0	21.3	23.8	25.4	28.7	30.4
F3L	62.2	65.4	68.4	73.7	80.3	83.5	87.7
F3P	20.1	20.7	22.8	24.8	28.1	29.7	30.8
F3M	20.1	21.6	23.1	24.9	27.7	29.4	30.8
F3D	18.7	20.6	22.1	24.1	25.9	28.6	30.4
F4L	59.0	60.3	62.1	67.0	72.7	78.3	82.4
F4P	17.4	18.2	19.8	21.7	24.8	26.4	28.2
F4M	18.2	19.3	20.9	22.3	24.0	26.9	29.7
F4D	19.2	20.1	21.0	23.4	25.9	27.4	28.8
F5L	44.1	46.0	48.6	54.0	58.2	63.8	68.3
F5P	13.8	14.9	15.6	17.1	19.0	21.0	22.7
F5M	11.6	12.2	13.7	15.4	16.8	18.5	19.7
F5D	16.1	17.4	19.2	21.6	23.2	25.4	27.4
RWW	48.7	50.8	54.2	56.9	59.6	62.3	63.6
RtLBL	24.1	27.6	31.0	34.8	38.2	43.1	45.3
RtMBL	54.2	55.8	59.4	65.7	73.3	82.3	84.4
RtL	148.6	149.6	159.7	167.9	176.5	188.6	193.9
RtHW	74.3	76.2	78.4	81.8	88.4	91.5	96.1

الملخص العربي

القياسات الانثروبولوجيا لليد المصرية لدى الكبار من خلال الصور

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الأنثروبومترى هو فرع من العلوم الذي يختص بدراسة قياسات جسم الإنسان، حيث تعود جذوره إلى العصور القديمة ولمجال القياسات الانثروبوميتريه الكثير من التطبيقات فى مجالات من بينها الطب والصناعة والعلوم الجنائية. تلعب القياسات البشرية لليدين دورا هاماً في التشخيص الطبي ، وتصميم الأدوات اليدوية ، وتحديد الهوية الشخصية. صممت هذه الدراسة لتقديم طريقة جديدة لقياسات اليد من خلال صورة فوتوغرافية.

و تعتبر هذه الطريقة الجديدة بسيطة وسهلة ودقيقة، حيث تم معايرة الصورة لتفادى مشكلة التكبير الشائعة في القياس الفوتوغرافي حيث كانت دقة القياسات ٠,٣٩٧ ٪. و تتميز هذه الطريقة الجديدة بميزة فريدة حيث يمكن للنظام تحديد نقاط محسوبة استنادًا إلى نقاط بسيطة. من عيوب النظام انه يعمل على القياسات فى مستوى واحد.

تضمنت الدراسة تطبيق الطريقة الجديدة على ١١٣ متطوع مصري بالغ (٥٨ ذكور و ٥٥ إناث) من ثلاثة مناطق جغرافيا (كفر الشيخ، الجيزة، والفيوم). تم إجراء ٢١ قياسًا لليدين، وتم تقديم المنحنيات المئوية، بالإضافة إلى معادلتين متعددي الحدود لحساب مئوية لطول وعرض اليد، كما تم إلقاء الضوء على اختلاف القياسات بين الحالات من الجنسين ذكورا و إناثا.