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AnthroPy – A python library for anthropometric and physiological calculations

Abstract

Anthropometric equations are widely used to estimate body composition, metabolic rate, and related physiological characteristics from simple body measurements. Over the past century, numerous empirical formulas have been developed. However, accessible programmatic implementations of these equations remain limited. This study presents AnthroPy, a Python library implementing a comprehensive set of anthropometric equations. The library includes 59 functions across 12 categories covering anthropometric indices, adiposity indices, body fat estimation methods, basal metabolic rate equations, body surface area formulas, lean body mass estimators, ideal body weight models, frame classification, and somatotype analysis. Standardized parameter naming ensures consistent use of anthropometric measurements across equations. A high-level profiling function enables automated computation of all applicable metrics from a single set of measurements; thus, providing a computational reference for anthropometry.

Keywords: anthropometry, body composition, body fat estimation, basal metabolic rate, python library, scientific software

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Introduction

Anthropometry; the measurement and analysis of the human body;[1] has been a cornerstone of biological, medical, and fitness sciences for over a century.[2] Historically, anthropometric equations have been developed to estimate body fat, lean mass, and other physiological parameters using simple measurements; such as, height, weight, circumferences, and skinfold thickness.[3–5] A variety of other methods exist, including circumference-based approaches,[5] skinfold-based formulas,[6,7] and mixed methods combining multiple measures.[8] Basal metabolic rate (BMR) equations, such as Harris–Benedict (1919),[9] Mifflin–St Jeor (1990),[10] and FAO/WHO/UNU (2004),[11] allow estimation of resting energy expenditure, an important stationary physiological parameter. Despite the wealth of historical equations, there is a lack of open reference implementations. In this study, AnthroPy addresses this gap by providing a comprehensive, programmatic Python library of validated anthropometric equations as a single pure Python file with no dependency, allowing it for import into any Python scripts. A total of 59 functions across 12 categories were implemented to support both research and educational applications.

Implementation

AnthroPy implements equations drawn from classical anthropometric and physiological literature spanning more than a century. Equations were selected based on their historical usage in anthropometric research and continued citation in contemporary physiology and nutrition literature. A total of 59 functions across 12 categories were implemented (see Table 1 for list of functions). These 12 categories are (i) Attributes (AT), (ii) Adiposity index (AI), (iii) Percent body fat by circumferences or girth measurements (BFc), (iv) Percent body fat by skinfold measurements (BFs), (v) Percent body fat by mixed measurements (BFx), (vi) Basal metabolic rate (BMR), (vii) Body surface area (BSA), (viii) Lean body mass (LBM), (ix) Ideal body weight (IBW), (x) Sum of skinfolds (SSF), (xi) Body frame classification (FC), and (xii) Somatotype (ST). Each function was name in the following format, <category>_<name>; hence, the function for estimating percent body fat by Behnke-Wilmore circumference method[7] is BFc_BehnkeWilmore.

Table 1 List of Functions

Category	Function Name	Description
AT	AT_Siri[3]	Convert body density to body fat percentage using the Siri equation.
AT	AT_Brozek[12]	Convert body density to body fat percentage using the Brozek equation.
AT	AT_BMI[13]	Calculate Body Mass Index (BMI).
AT	AT_PI[14]	Calculate Ponderal Index (PI).
AT	AT_TCR	Calculate Thigh-to-Calf Ratio.
AT	AT_FWR	Calculate Forearm-to-Wrist Ratio.
AT	AT_CHt	Calculate Calf-to-Height Ratio.
AT	AT_NHtR	Calculate Neck-to-Height Ratio.
AI	AI_WHR	Calculate Waist-to-Hip Ratio (WHR).
AI	AI_WHtR	Calculate Waist-to-Height Ratio (WHtR).
AI	AI_WTR	Calculate Waist-to-Thigh Ratio (WTR).
AI	AI_ABSI[15]	Calculate A Body Shape Index (ABSI).
AI	AI_ConicityIndex[16]	Calculate Conicity Index (CI).

Table 1 Continued....

AI	AI_WCR	Calculate Waist-to-Calf Ratio.
AI	AI_WHtPI	Calculate Waist-to-Height Power Index (WHtPI).
AI	AI_BRI	Calculate Body Roundness Index (BRI).
BFc	BFc_USNavy[5]	Calculate body fat percentage using the US Navy method.
BFc	BFc_YMCA[17]	Calculate body fat percentage using the YMCA method.
BFc	BFc_mYMCA[17]	Calculate body fat percentage using the modified YMCA method.
BFc	BFc_CovertBailey[18]	Calculate body fat using the Covert Bailey method.
BFc	BFc_BehnkeWilmore[7]	Calculate body fat percentage using the Behnke-Wilmore circumference method.
BFc	BFc_RFM[19]	Calculate body fat percentage using the Relative Fat Mass (RFM) equation.
BFc	BFc_BAI[20]	Calculate Body Adiposity Index (BAI), an estimation of body fat percentage
BFs	BFs_JacksonPollock3[6]	Calculate body fat percentage using the Jackson-Pollock 3-site method.
BFs	BFs_JacksonPollock4[6]	Calculate body fat percentage using the Jackson-Pollock 4-site method.
BFs	BFs_JacksonPollock7[6]	Calculate body fat percentage using the Jackson-Pollock 7-site method.
BFs	BFs_BehnkeWilmore[7]	Calculate body fat percentage using the Behnke-Wilmore skinfold method.
BFs	BFs_DurninWomersley[21]	Calculate body fat percentage using the Durnin–Womersley 4-site skinfold method.
BFs	BFs_Sloan[22]	Calculate body fat percentage using the Sloan equation (1967).
BFs	BFs_Parrillo[23]	Calculate body fat percentage using the Parrillo 9-site skinfold method.
BFx	BFx_BMI[24]	Calculate body fat percentage using the BMI-based method, which is also Deurenberg's equation.
BFx	BFx_JacksonPollock3Girth[6]	Calculate body fat percentage using the Jackson-Pollock 3-site + girth method.
BFx	BFx_Henry2018[8]	Calculate body fat percentage using the Henry et al. (2018) method for Asian Chinese.
BMR	BMR_MifflinStJeor[10]	Calculate basal metabolic rate (BMR) using the Mifflin-St Jeor equation.
BMR	BMR_HarrisBenedict[9]	Calculate basal metabolic rate (BMR) using the Harris-Benedict equation.
BMR	BMR_Kleiber25	Calculate basal metabolic rate (BMR) using Kleiber's law.
BMR	BMR_RozaShizgal[9]	Calculate basal metabolic rate (BMR) using the Roza-Shizgal revision of the Harris-Benedict equation.
BMR	BMR_Schofield[26]	Calculate Basal Metabolic Rate (BMR) using the Schofield (1985) equations.
BMR	BMR_Cunningham[27]	Calculate Basal Metabolic Rate (BMR) using the Cunningham (1980) equation.
BMR	BMR_KatchMcArdle[28]	Calculate Basal Metabolic Rate (BMR) using the Katch and McArdle (1983) equation.
BMR	BMR_FAO2004[11]	Calculate Basal Metabolic Rate (BMR) using the FAO/WHO/UNU (2004) equations.
BSA	BSA_DuBois[29]	Calculate Estimate body surface area (BSA) using the Du Bois & Du Bois (1916) formula.
BSA	BSA_Mosteller[30]	Calculate body surface area (BSA) using the Mosteller (1987) formula.
BSA	BSA_Haycock[31]	Calculate body surface area (BSA) using the Haycock et al. (1978) formula.
BSA	BSA_GehanGeorge[32]	Calculate Body Surface Area (BSA) using the Gehan & George (1970) formula.
BSA	BSA_Fujimoto[33]	Calculate Body Surface Area (BSA) using the Fujimoto formula.
LBM	LBM_Boer[34]	Calculate Lean Body Mass (LBM) using the Boer (1984) formula.
LBM	LBM_James[35]	Calculate Lean Body Mass (LBM) using the James (1977) formula.
LBM	LBM_Hume[36]	Calculate Lean Body Mass (LBM) using the Hume (1966) formula.
IBW	IBW_Robinson[37]	Calculate Ideal Body Weight (IBW) using the Robinson (1983) formula.
IBW	IBW_Miller[38]	Calculate Ideal Body Weight (IBW) using the Miller formula.
IBW	IBW_Hamwi[39]	Calculate Ideal Body Weight (IBW) using the Hamwi formula.
IBW	IBW_Devine[40]	Calculate Ideal Body Weight (IBW) using the Devine formula.
IBW	IBW_Lemmens[41]	Calculate Ideal Body Weight (IBW) using the Lemmens et al. (2005) formula.
IBW	IBW_Peterson[42]	Calculate Ideal Body Weight (IBW) using the Peterson et al. (2016) formula.
IBW	IBW_KeysBrozek[4]	Calculate Ideal Body Weight (IBW) using the Keys & Brozek (1953) formula.
SSF	SSF	Calculate Sum of Skinfolds (SSF) based on predefined or custom fold sets.
FC	FC_Metropolitan[43]	Classify body frame size using Body Frame Index (Metropolitan Life, 1983).
ST	ST_HeathCarter[44]	Classify somatotype using Heath–Carter method.

To ensure correctness of the implemented equations, selected functions in AnthroPy were verified using sample values and manually calculated using the respectively published equations (demonstrated in Example Usage section below, and shown in Figure 1). All numerical computations were implemented using Python double-precision floating-point arithmetic, with output rounding controlled through the decimal precision parameter. For each equation, representative input values were obtained from published examples when available or reconstructed from the formula definitions. Computed outputs from AnthroPy were then compared with manually calculated values using the same equations. Numerical agreement was verified within rounding tolerance determined by the specified decimal precision parameter. In addition, cross-validation was performed between related functions when appropriate; for example, body density estimates produced by skinfold equations were converted to percent body fat using both Siri and Brozek converters to confirm consistency with reported values. Unit handling and parameter definitions were also checked to ensure correspondence with the measurement conventions described in the source literature. These checks confirmed that the library reproduces the expected outputs of the underlying anthropometric equations.

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```
(base) C:\Dropbox\MyProjects\bactome>python anthropy.py test
==================================================
Anthropometrical Report by AnthroPy
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Anthropometric Indices:
----------------------
  AT_BMI                              : 25.06 kg/m^2
  AT_PI                               : 14.49 kg/m^2
  AT_TCR                              : 1.3947
  AT_FWR                              : 1.4706
  AT_CHtR                             : 0.2197
  AT_NHtR                             : 0.2197
Description: (a) AT_BMI: Body Mass Index (BMI). (b) AT_PI: P
onderal Index (PI). (c) AT_TCR: Thigh-to-Calf Ratio. (d) AT_
FWR: Forearm-to-Wrist Ratio. (e) AT_CHtR: Calf-to-Height Rat
io (f) AT_NHtR: Neck-to-Height Ratio

Adiposity Indices:
-----------------
  AI_WHR                              : 0.89
  AI_WHtR                             : 0.49
  AI_WTR                              : 1.6
  AI_ABSI                             : 0.075464
  AI_ConicityIndex                    : 1.1844
  AI_WCR                              : 2.2368
  AI_WHtPI                            : 0.0028
  AI_BRI                              : 3.2
Description: (a) AI_WHR: Waist-to-Hip Ratio. (b) AI_WHtR: Wa
ist-to-Height Ratio. (c) AI_WTR: Waist-to-Thigh Ratio. (d) A
I_ABSI: A Body Shape Index. (e) AI_ConicityIndex: Conicity I
ndex. (f) AI_WCR: Waist-to-Calf Ratio. (g) AI_WHtPI: Waist-t
o-Height Power Index. (h) AI_BRI: Body Roundness Index

Body Fat (Circumference):
------------------------
  BFc_USNavy                          : 17.28 %
  BFc_YMCA                            : 16.27 %
  BFc_CovertBailey                    : 18.9 %
  BFc_BehnkeWilmore                   : 16.14 %
  BFc_RFM                             : 23.29 %
  BFc_BAI                             : 23.75 %
Description: (a) BFc_USNavy: US Navy method. (b) BFc_YMCA: Y
MCA method. (c) BFc_mYMCA: Modified YMCA method. (d) BFc_Cov
ertBailey: Covert Bailey method. (e) BFc_BehnkeWilmore: Behn
ke-Wilmore circumference method. (f) BFc_RFM: Relative Fat M
ass. (g) BFc_BAI: Body Adiposity Index.

Body Fat (Skinfold):
--------------------
  BFs_JacksonPollock3                 : 12.48 %
  BFs_JacksonPollock4                 : 14.3 %
  BFs_JacksonPollock7                 : 14.53 %
  BFs_BehnkeWilmore                   : 14.4 %
  BFs_DurninWomersley                 : 21.31 %
  BFs_Sloan                           : 20.84 %
  BFs_Parrillo                        : 17.96 %
Description: (a) BFs_JacksonPollock3: Jackson-Pollock 3-site
 method. (b) BFs_JacksonPollock4: Jackson-Pollock 4-site met
hod. (c) BFs_JacksonPollock7: Jackson-Pollock 7-site method.
 (d) BFs_BehnkeWilmore: Behnke-Wilmore skinfold method. (e)
BFs_DurninWomersley: Durnin-Womersley 4-site skinfold method
. (f) BFs_Sloan: Sloan equation (1967). (g) BFs_Parrillo: Pa
rrillo 9-site formula.

Body Fat (Other):
-----------------
  BFx_BMI                             : 22.15 %
  BFx_JacksonPollock3Girth            : 15.55 %
  BFx_Henry2018                       : 19.89 %
  BF-Average                          : 18.065 %
Description: (a) BFx_BMI: Estimate from BMI using Deurenberg
's equation. (b) BFx_JacksonPollock3Girth: Jackson-Pollock 3
-site + girth method.  (c) BFx_Henry2018: Henry et al. (2018
) method for Asian Chinese.

Basal Metabolic Rate:
--------------------
  BMR_MifflinStJeor                   : 1656.25 kcal/day
  BMR_HarrisBenedict                  : 1720.09 kcal/day
  BMR_Kleiber                         : 1784.0 kcal/day
  BMR_RozaShizgal                     : 1718.99 kcal/day
  BMR_Schofield                       : 1733.5 kcal/day
  BMR_Cunningham                      : 1765.44 kcal / day
  BMR_KatchMcArdle                    : 1612.43 kcal/day
  BMR_FAO2004                         : 1749.0 kcal/day
  BMR-Average                         : 1717.46 kcal/day
Description: (a) BMR_MifflinStJeor: Mifflin-St Jeor equation
. (b) BMR_HarrisBenedict: Harris-Benedict equation. (c) BMR_
Kleiber: Kleiber's law. (d) BMR_RozaShizgal: Roza-Shizgal re
vision of the Harris-Benedict equation. (e) BMR_Schofield: S
chofield equation. (f) BMR_Cunningham: Cunningham (1980) equ
ation. (g) BMR_KatchMcArdle: Katch and McArdle (1983) equati
on. (h) BMR_FAO2004: FAO/WHO/UNU (2004) equations.

Body Surface Area:
-----------------
  BSA_DuBois                          : 1.89 m^2
  BSA_Mosteller                       : 1.9 m^2
  BSA_Haycock                         : 1.91 m^2
  BSA_GehanGeorge                     : 1.9115 m^2
  BSA_Fujimoto                        : 1.8404 m^2
  BSA-Average                         : 1.8904 m^2
Description: (a) BSA_DuBois: Du Bois & Du Bois (1916) formul
a. (b) BSA_Mosteller: Mosteller (1987) formula. (c) BSA_Hayc
ock: Haycock et al. (1978) formula. (d) BSA_GehanGeorge: Geh
an & George (1970) formula. (e) BSA_Fujimoto: Fujimoto formu
la

Lean Body Mass:
--------------
  LBM_Boer                            : 57.52 kg
  LBM_James                           : 58.44 kg
  LBM_Hume                            : 53.77 kg
  LBM-Average                         : 56.6 kg
Description: (a) LBM_Boer: Boer (1984) formula. (b) LBM_Jame
s: James (1977) formula. (c) LBM_Hume: Hume (1966) formula.

Ideal Body Weight:
-----------------
  IBW_Robinson                        : 67.41 kg
  IBW_Miller                          : 67.64 kg
  IBW_Hamwi                           : 69.9 kg
  IBW_Devine                          : 68.65 kg
  IBW_Lemmens                         : 65.84 kg
  IBW_Peterson                        : 75.31 kg
  IBW_KeysBrozek                      : 66.89 kg
  IBW-Average                         : 68.8 kg
Description: (a) IBW_Robinson: Robinson (1983) formula. (b)
IBW_Miller: Miller et al. (1983) formula. (c) IBW_Hamwi: Ham
wi (1964) formula. (d) IBW_Devine: Devine (1974) formula. (e
) IBW_Lemmens: Lemmens et al. (2005) formula. (f) IBW_Peters
on: Peterson et al. (2016) formula. (g) IBW_KeysBrozek: Keys
 & Brozek (1953) formula.

Frame Classification:
--------------------
  FC_Metropolitan                     : Medium
Description: (a) FC_Metropolitan: Metropolitan Life (1983)

Somatotype (Heath-Carter):
-------------------------
  ST_HeathCarter (Endomorphy)         : 4.18
  ST_HeathCarter (Mesomorphy)         : 25.05
  ST_HeathCarter (Ectomorphy)         : 1.45
Description: (a) ST_HeathCarter: Heath and Carter method.

End of Report
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(base) C:\Dropbox\MyProjects\bactome>
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Figure 1 Example of Execution Using Sample Measurements.

A total of 26 anthropometrical parameters were used in these functions. However, it is common for the same anatomical location to be measured differently; for example, calf circumference and calf skinfold. This can easily lead to confusion. Hence, each of these anthropometrical parameters were prefixed by their type and the camel-cased; for example, calf circumference and calf skinfold were denoted as cCalf and sCalf, respectively. As such, 5 categories were defined : (i) attributes, consisting of age (as aAge), BMI (as aBMI), density (as aDensity, and calculated from other parameters), and gender (as aGender); (ii) measurements, consisting of height (as mHeight), and weight (as mWeight); (iii) circumferences, consisting of bicep (as cBicep), calf (as cCalf), forearm (as cForearm), hip (as cHip), neck (as cNeck), thigh (as cThigh), waist (as cWaist), and wrist (as cWrist); (iv) skinfolds, consisting of abdomen (as sAbdomen), bicep (as

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sBicep), calf (as sCalf), chest (as sChest), lowerback (as sLowerback), midaxillary (as sMidaxillary), subscapular (as sSubscapular), suprailiac (as sSuprailiac), thigh (as sThigh), and tricep (as sTricep); (v) bone breadths, consisting of femur (as bFemur), and humerus (as bHumerus). Unless otherwise specified in the original publication, anthropometric measurements were standardized to metric units (cm, kg, mm) prior to computation to ensure consistency across equations. The usages of these 26 anthropometrical parameters are given in Table 2. In addition to these 26 parameters, there are 2 parameters – (i) decimal places (as dp to control the number of decimal places for returned result), which is present in all functions; and (ii) converter for functions that can select between different converters if appropriate (for example; Siri and Brozek equations for density to percent body fat conversion; or Boer, James, or Hume equations for lean body mass calculation in basal metabolic rate).

Table 2 List of parameters and their usages

Parameter Name	Unit	Used in Functions
aAge	Year	(i) BFc_CovertBailey, (ii) BFs_JacksonPollock3, (iii) BFs_JacksonPollock4, (iv) BFs_JacksonPollock7, (v) BFs_DurninWomersley, (vi) BFx_BMI, (vii) BFx_JacksonPollock3Girth, (viii) BFx_Henry2018, (ix) BMR_MifflinStJeor, (x) BMR_HarrisBenedict, (xi) BMR_RozaShizgal, (xii) BMR_Schofield, (xiii) BMR_FAO2004,
aBMI	kg / m²	(i) BFx_BMI
aDensity	g / cm³	(i) AT_Siri, (ii) AT_Brozek
aGender	No unit	(i) BFc_USNavy, (ii) BFc_YMCA, (iii) BFc_mYMCA, (iv) BFc_CovertBailey, (v) BFc_RFM, (vi) BFs_JacksonPollock3, (vii) BFs_JacksonPollock4, (viii) BFs_JacksonPollock7, (ix) BFs_DurninWomersley, (x) BFs_Sloan, (xi) BFx_BMI, (xii) BFx_JacksonPollock3Girth, (xiii) BFx_Henry2018, (xiv) BMR_MifflinStJeor, (xv) BMR_HarrisBenedict, (xvi) BMR_RozaShizgal, (xvii) BMR_Schofield, (xviii) BMR_Cunningham, (xix) BMR_KatchMcArdle, (xx) BMR_FAO2004, (xxi) LBM_Boer, (xxii) LBM_James, (xxiii) LBM_Hume, (xxiv) IBW_Robinson, (xxv) IBW_Miller, (xxvi) IBW_Hamwi, (xxvii) IBW_Devine, (xxviii) IBW_KeysBrozek, (xxix) FC_Metropolitan, (xxx) ST_HeathCarter
mHeight	cm	(i) AT_BMI, (ii) AT_PI, (iii) AT_CHtR, (iv) AT_NHtR, (v) AI_WHtR, (vi) AI_ABSI, (vii) AI_ConicityIndex, (viii) AI_WHtPI, (ix) AI_BRI, (x) BFc_USNavy, (xi) BFc_RFM, (xii) BFc_BAI, (xiii) BFx_Henry2018, (xiv) BMR_MifflinStJeor, (xv) BMR_HarrisBenedict, (xvi) BMR_RozaShizgal, (xvii) BMR_Cunningham, (xviii) BMR_KatchMcArdle, (xix) BSA_DuBois, (xx) BSA_Mosteller, (xxi) BSA_Haycock, (xxii) BSA_GehanGeorge, (xxiii) BSA_Fujimoto, (xxiv) LBM_Boer, (xxv) LBM_James, (xxvi) LBM_Hume, (xxvii) IBW_Robinson, (xxviii) IBW_Miller, (xxix) IBW_Hamwi, (xxx) IBW_Devine, (xxxi) IBW_Lemmens, (xxxii) IBW_Peterson, (xxxiii) IBW_KeysBrozek, (xxxiv) FC_Metropolitan, (xxxv) ST_HeathCarter
mWeight	kg	(i) AT_BMI, (ii) AT_PI, (iii) AI_ABSI, (iv) AI_ConicityIndex, (v) BFc_YMCA, (vi) BFc_mYMCA, (vii) BFc_BehnkeWilmore, (viii) BFs_JacksonPollock7, (ix) BFs_BehnkeWilmore, (x) BFs_Parrillo, (xi) BMR_MifflinStJeor, (xii) BMR_HarrisBenedict, (xiii) BMR_Kleiber, (xiv) BMR_RozaShizgal, (xv) BMR_Schofield, (xvi) BMR_Cunningham, (xvii) BMR_KatchMcArdle, (xviii) BMR_FAO2004, (xix) BSA_DuBois, (xx) BSA_Mosteller, (xxi) BSA_Haycock, (xxii) BSA_GehanGeorge, (xxiii) BSA_Fujimoto, (xxiv) LBM_Boer, (xxv) LBM_James, (xxvi) LBM_Hume, (xxvii) IBW_Peterson
cBicep	cm	(i) ST_HeathCarter
cCalf	cm	(i) AT_TCR, (ii) AT_CHtR, (iii) AI_WCR, (iv) BFc_CovertBailey, (v) ST_HeathCarter
cForearm	cm	(i) AT_FWR, (ii) BFc_mYMCA, (iii) BFc_CovertBailey, (iv) BFx_JacksonPollock3Girth
cHip	cm	(i) AI_WHR, (ii) BFc_USNavy, (iii) BFc_mYMCA, (iv) BFc_CovertBailey, (v) BFc_BAI, (vi) BFx_JacksonPollock3Girth
cNeck	cm	(i) AT_NHtR, (ii) BFc_USNavy
cThigh	cm	(i) AT_TCR, (ii) AI_WHtR, (iii) AI_WTR, (iv) BFc_CovertBailey
cWaist	cm	(i) AI_WHR, (ii) AI_WTR, (iii) AI_ABSI, (iv) AI_ConicityIndex, (v) AI_WCR, (vi) AI_WHtPI, (vii) AI_BRI, (viii) BFc_USNavy, (ix) BFc_YMCA, (x) BFc_mYMCA, (xi) BFc_CovertBailey, (xii) BFc_BehnkeWilmore, (xiii) BFc_RFM, (xiv) BFx_JacksonPollock3Girth, (xv) BFx_Henry2018
cWrist	cm	(i) AT_FWR, (ii) BFc_mYMCA, (iii) BFc_CovertBailey, (iv) FC_Metropolitan
bFemur	cm	(i) ST_HeathCarter
bHumerus	cm	(i) ST_HeathCarter
sAbdominal	mm	(i) BFs_JacksonPollock3, (ii) BFs_JacksonPollock4, (iii) BFs_JacksonPollock7, (iv) BFs_BehnkeWilmore, (v) BFs_Parrillo, (vi) BFx_JacksonPollock3Girth, (vii) SSF
sBicep	mm	(i) BFs_DurninWomersley, (ii) BFs_Parrillo, (iii) BFx_Henry2018, (iv) SSF
sCalf	mm	(i) BFs_Parrillo, (ii) SSF
sChest	mm	(i) BFs_JacksonPollock3, (ii) BFs_JacksonPollock4, (iii) BFs_Parrillo, (iv) BFx_JacksonPollock3Girth, (v) SSF
sLowerback	mm	(i) BFs_Parrillo, (ii) SSF
sMidaxillary	mm	(i) BFs_JacksonPollock7, (ii) SSF
sSubscapular	mm	(i) BFs_JacksonPollock7, (ii) BFs_DurninWomersley, (iii) BFs_Parrillo, (iv) SSF, (v) ST_HeathCarter
sSuprailiac	mm	(i) BFs_JacksonPollock4, (ii) BFs_JacksonPollock7, (iii) BFs_DurninWomersley, (iv) BFs_Sloan, (v) BFs_Parrillo, (vi) BFx_JacksonPollock3Girth, (vii) SSF, (viii) ST_HeathCarter
sThigh	mm	(i) BFs_JacksonPollock3, (ii) BFs_JacksonPollock4, (iii) BFs_JacksonPollock7, (iv) BFs_Parrillo, (v) BFx_JacksonPollock3Girth, (vi) SSF
sTricep	mm	(i) BFs_JacksonPollock4, (ii) BFs_JacksonPollock7, (iii) BFs_DurninWomersley, (iv) BFs_Sloan, (v) BFs_Parrillo, (vi) BFx_JacksonPollock3Girth, (vii) BFx_Henry2018, (viii) SSF, (ix) ST_HeathCarter

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Example usage

To demonstrate the functionality of AnthroPy, a simple test routine is provided through the function tester(), which can be executed from the command line using python anthropy.py test." It will populate a measurement dictionary with values for age, sex, body mass, height, circumferences, bone breadths, and skinfold thicknesses. These measurements are then passed to the profile() function as a Python dictionary, which automatically computes all applicable anthropometric and physiological metrics. The resulting outputs include anthropometric indices, adiposity indices, multiple body fat estimates, basal metabolic rate, body surface area, lean body mass, ideal body weight, frame classification, and somatotype components. The results from profile() function were returned as a Python dictionary, which allows for profile() function to be a handy function access when used programmatically as {results dictionary} = profile({measurements dictionary}). In addition, the results dictionary can be formatted and displayed by physiological category using report() function (Figure 1). This workflow illustrates how AnthroPy can generate a comprehensive anthropometric profile from a single measurement dataset.

Conclusion

AnthroPy consolidates widely used anthropometric equations into a standardized Python library. By providing a reproducible computational reference and an integrated profiling workflow, the library enables rapid estimation of multiple body composition and physiological metrics from basic anthropometric measurements. The software may support research, education, and applied health analysis.

Supplementary materials

AnthroPy (module file = anthropy.py; parameter to function matrix in anthropy.xlsx) has been deposited in Bactome repository (https://github.com/mauriceling/bactome) under GNU General Public License version 3 for academic or not-for-profit use only, and can be downloaded at https://bit.ly/anthropy_1.

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None.

Conflicts of interest

The authors declare no conflict of interest.

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