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**ISO committee and PCA:**

**Minimum frontal breadth** (we didn’t collect this)

**Face width/bizygomatic breadth linear**

**Bigonial breadth/gonion to gonion linear** (we didn’t collect this)

**Face Length/nasal root depression to menton/Sellion menton linear**

**Interpupillary distance** (we didn’t collect this)

**Nose protrusion/Subnasale to Pronasale linear**

**Nose breadth/alare to alare linear**

**Nasal root breadth**

**Subnasale-sellion length** (we didn’t collect this, may use Sellion to Pronasale instead)

**PCA only:**

**Head breadth/tragion to tragion**

**Have to consider that in person, linear measurements are best to collect. But, when making a molded respirator from plastic, contour measurements might be better. Either way, the contour measurements provide something new to the literature.**

**Alare to Alare Contour (AA\_C) - INCLUDE**

* Correlated with Pronasale to Alare Contour, 0.8870 HIGH
* Correlated with Pronasale to Alare Linear, 0.8962 HIGH
* 17 missing values
* intraRR Coder A= 0.987
* intraRR Coder B=0.974
* intraRR Coder C=0.974
* IntraRR Coder D=0.969
* interRR= 0.952
* Choose between this and ProA\_C and ProA\_C
* Nose Breadth LINEAR included in Zhuang 2007 PCA analysis
* Nose Breadth LINEAR considered relevant to respirator fit by ISO committee
* May need to justify why not Alare to Alare Linear
  + It was not collected due to likely very high correlation with contour
  + Measurements that were collected in previous studies were not necessarily collected here. There are no standards for respirator measurements, and 3D allowed for the collection and utilization of new measurements.



**Back of Head to Glabella Contour (BGl\_C) - DROP**

* Not highly correlated with any other measure
* 520 missing values (25%, highest of all measures by double percentage-wise)
* intraRR Coder A= 0.96
* intraRR Coder B= 0.974
* intraRR Coder C=0.856
* intraRR Coder D=0.947
* interRR=0.043 LOW
* Head circumference not included in Zhuang 2007 PCA analysis
* Not in list of top relevant measures for respirator fit by ISO committee
* Even though this is the only head circumference measure, it would makes sense to drop it due to high NA values and low interRR icc value
* Perhaps head circumference is not exactly needed when respirator straps can be made adjustable

**Bizygomatic Width Contour (BiW\_C)- INCLUDE**

* Correlated with Bizygomatic Width Linear: 0.8934 HIGH
* 17 missing values
* intraRR Coder A= 0.917
* intraRR Coder B= 0.944
* intraRR Coder C=0.849
* intraRR Coder D=0.962
* interRR=0.528 Lower than Linear measurement
* Bizygomatic Breadth LINEAR included in Zhaung 2007 PCA
* Bizygomatic Breadth LINEAR considered relevant to respirator fit by ISO committee
* Even though interRR is lower, it may make sense to use contour instead of linear version considering we are trying to evaluate novel 3D measures
* Average is around 132mm, notably different from linear

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**Bizygomatic Width Linear (BiW\_L)- INCLUDE**

* Correlation with Bizygomatic Width Contour: 0.8934 HIGH
* 17 missing values
* intraRR coder A: 0.924
* intraRR coder B: 0.915 LOWER than contour, collected almost 50% of the data
* intraRR coder C: 0.692 Lower than contour
* intraRR coder D: 0.926 Lower than contour
* interRR: 0.689
* Bizygomatic Breadth LINEAR included in Zhaung 2007 PCA
* Bizygomatic Breadth LINEAR considered relevant to respirator fit by ISO committee
* Even though interRR is higher, it may make sense to use contour instead of linear version considering we are trying to evaluate novel 3D measures
* Coder B IntraRR is lower for linear
* Average is around 110mm, notably different from contour

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**Cheilion to Cheilion Contour (ChCh\_C) -DROP**

* Not highly correlated with any other measure
* 43 missing values
* intraRR coder A= 0.984
* intraRR coder B= 0.968
* intraRR coder C= 0.924
* intraRR coder D=0.949
* interRR= 0.966
* not in PCA Zhaung panel
* not considered important to respirator fit ISO committee
* used as third measurement in LANL and deemed critical for respirator fit at that time
* important for mouth bite devices

**Gonion to Submandibular Contour (GoSub\_C) – INCLUDE**

* Correlated with Tragion Submandibular Contour: 0.785
* 127 missing values
* intraRR coder A=0.937
* intraRR coder B=0.950
* intraRR coder C= 0.919
* intraRR coder D=0.944
* interRR=0.923
* not in PCA Zhaung panel
* not considered important to respirator fit ISO committee
* could be good to include because it does seem relevant to respirator fit and not previously collected in facial anthro surveys
* submandibular was a little hard to locate on people who had high BMI because body fat occluded neck, however, this would affect respirator fit anyway
* Even though correlated with Tragion Submandibular and that is included as well, both together give good context to face length

**Nasal Root Breadth Length (NRB\_L)- INCLUDE**

* not highly correlated with any other measure
* 15 missing values
* intraRR coder A: 0.830
* intraRR coder B: 0.757
* intraRR coder C: 0.384
* intraRR coder D: 0.915
* interRR: 0.245
* included in Zhaung PCA panel
* considered relevant to respirator fit by ISO panel
* coder B icc is considered fair
* iccs are not super strong, but this seems important to respirator fit across the board



**Pronasale to Alare Linear (ProA\_L) – DROP**

* Correlated with Alare to Alare Contour 0.8962
* Correlated with Pronasale to Alare Contour 0.9712
* 16 missing values
* intraRR coder A= 0.986
* intraRR coder B= 0.974
* intraRR coder C=0.961
* intraRR coder D=0.982
* interRR 0.950
* not included in Zhaung PCA panel
* not considered important to respirator fit ISO committee
* Too repetitive with AA\_C which goes over the nose

**Pronasale to Alare Contour (ProA\_C)- DROP**

* Correlated with Alare to Alare contour 0.8870
* Correlated with Pronasale to Alare Linear 0.9712
* 16 missing values
* intraRR coder A=0.975
* intraRR coder B=0.960
* intraRR coder C=0.945
* intraRR coder D=0.964
* interRR=0.931
* not included in Zhaung PCA panel
* not considered important to respirator fit ISO committee
* good icc values, but not notably better than AA\_C, too repetitive to include both (AA\_C is over the nose)

**Pronasale to Subnasale Linear (ProS\_L)- INCLUDE**

* Correlated with Pronasale to Subnasale Contour 0.8963
* 19 missing values
* intraRR coder A: 0.931
* intraRR coder B: 0.931
* intraRR coder C: 0.955
* intraRR coder D: 0.975
* interRR: 0.938
* included in Zhaung PCA panel (nose protrusion)
* considered relevant to respirator fit by ISO committee
* slightly smaller than ProS\_C (17 mm average)



**Pronasale to Subnasale Contour (ProS\_C) - DROP**

* Correlated with Pronasale to Subnasale Linear 0.8963
* 31 missing values
* intraRR coder A: 0.969
* intraRR coder B: 0.941 HIGHER than coder B intraRR for linear
* intraRR coder C: 0.686
* intraRR coder D: 0.967
* interRR: 0.850
* LINEAR version include in Zhaung PCA panel (nose protrusion)
* LINEAR version considered relevant to respirator fit by ISO committee
* Slightly larger than ProS\_L (19mm) but not enough to include both
* Even though interRR is lower, it may make sense to use contour instead of linear version considering we are trying to evaluate novel 3D measures

**Sellion to Pronasale Length (SelP\_L) - INCLUDE**

* Correlated with Sellion to Pronasale contour 0.9931
* 15 missing values
* intraRR coder A: 0.991
* intraRR coder B: 0.978
* intraRR coder C: 0.970
* intraRR coder D: 0.992
* interRR: 0.968
* not included in Zhaung PCA panel
* not important for respirator fit ISO committee
* Sellion to Subnasale was not collected in this work (despite being included in Zhaung PCA and relevant to respirator fit by ISO panel), so this or contour measure may make a good substitute
* Average is around 45mm, pretty much same as contour measure

**Sellion to Pronasale Contour (SelP\_C) - DROP**

* Correlated with Sellion to Pronasale linear 0.9931
* 15 missing values
* intraRR coder A: 0.991
* intraRR coder B: 0.977
* intraRR coder C: 0.962
* intraRR coder D: 0.992
* interRR: 0.850 LOWER than linear
* not included in Zhaung PCA panel
* not important for respirator fit ISO committee
* Sellion to Subnasale was not collected in this work (despite being included in Zhaung PCA and relevant to respirator fit by ISO panel), so this measure may make a good substitute
* Even though interRR is lower, contour is novel 3D measurement
* Average is around 45 mm (same as length measure)

**Sellion to Dorsal Hump Contour (SelDH\_C) – DROP**

* Not correlated with any other measure
* 14 missing values
* intraRR coder A: 0.926
* intraRR coder B: 0.920
* intraRR coder C: 0.503
* intraRR coder D: 0.943
* interRR: 0.825
* not included in Zhuang PCA panel
* not considered important to respirator fit by ISO committee
* probably repetitive with Sellion to Pronasale
* Dorsal hump could only be accurately placed on people on which it was prominent. It seems like most times, people would want their respirators to sit on this bone, as above may be too close to the eyes and below might constrict airflow. More research about this is needed (qualitative to ascertain if this is best placement for respirator to sit, and quantitative to feel for dorsal hump and accurately collect measure.

**Sellion to Menton Linear (SelM\_L) – INCLUDE**

* Correlated with Subnasale Menton Contour 0.8020
* Correlated with Subnasale Menton Linear 0.8641
* 224 missing values (11%)
* intraRR Coder A: 0.995
* intraRR Coder B: 0.969
* intraRR Coder C: 0.977
* intraRR coder D: 0.997
* interRR: 0.873
* included in Zhaung PCA panel
* considered important for respirator fit by ISO committee



**Subnasale to Menton Linear (SnasM\_L) – DROP**

* Correlated with Sel Menton Linear 0.8641
* Correlated with Subnasale Menton Contour 0.9466
* 225 missing values (11.1%)
* IntraRR coder A: 0.954
* IntraRR coder B: 0.849
* intraRR coder C: 0.899
* intraRR coder D: 0.986
* interRR: 0.521
* not included in Zhaung PCA panel
* not considered important for respirator fit ISO committee

**Subnasale to Menton Contour (SnasM\_C) – INCLUDE**

* Correlated with Sellion to Menton Linear 0.8020
* Correlated with Subnasale to Menton Linear 0.9466
* 236 missing values (11.7%)
* intraRR coder A: 0.980
* intraRR coder B: 0.921 (higher than linear)
* intraRR coder C: 0.963
* intraRR coder D: 0.989
* interRR 0.809 (higher than linear)
* not included in Zhaung PCA panel
* not considered important for respirator fit ISO committee
* I want to include this because I think it gives contour context to the Sellion to Menton Linear, in conjunction with sellion to pronasale linear and Pronasale to Subnasale linear (creates full Sellion to menton contour measure)

**Submandibular to Menton Linear (SmanM\_L) – DROP**

* Correlated with Submandibular to Menton Contour 0.9614
* 242 missing values (12%)
* intraRR coder A: 0.522
* intraRR coder B: 0.692
* intra RR coder C: 0.879
* intraRR coder D: 0.964
* interRR 0.299
* not included in Zhaung PCA panel
* not considered important for respirator fit ISO committee

**Submandibular to Menton Contour (SmanM\_C) – DROP**

* correlated with Submandibular to Menton Linear 0.9614
* 281 missing values (14%)
* intraRR coder A: 0.457
* intraRR coder B: 0.740
* intraRR coder C: 0.885
* intraRR coder D: 0.970
* interRR: 0.329
* not included in Zhaung PCA panel
* not considered important to respirator fit ISO committee
* want to include, but low interRR and intraRR values
* I think gives info that has not previously been captured, and provides context to Tragion Submandibular contour
* Submandibular was variable based on BMI
* Might help with sizing N95s?

**Top of Head to Otobasion Contour (TrHO\_C) – DROP**

* Not highly correlated with any other measurement
* 283 missing values (14%)
* intraRR coder A: 0.981
* intraRR coder B: 0.971
* intraRR coder C: 0.857
* intra RR coder D: 0.964
* interRR: 0.871
* not included in PCA Zhaung panel
* not considered important to respirator fit ISO committee

**Tragion to Earlobe Juncture Contour (TrEJ\_C) – DROP**

* Not highly correlated with any other measurement
* 33 missing values
* intraRR coder A: 0.979
* intraRR coder B: 0.935
* intraRR coder C: 0.946
* intraRR coder D: 0.823
* interRR: 0.776
* not included in Zhaung PCA panel
* not considered important to respirator fit ISO committee
* often occluded by helix

**Tragion to Gonion Contour (TrGo\_C) – DROP**

* Not highly correlated with any other measure
* 80 missing values (4%)
* intraRR coder A: 0.971
* intraRR coder B: 0.969
* intraRR coder C: 0.871
* intraRR coder D: 0.777
* interRR: 0.880
* not included in Zhaung PCA panel
* not considered important for respirator fit ISO committee
* often occluded by helix

**Tragion to Sellion Contour (TrSel\_C) – DROP**

* Correlated with Tragion to Submandibular Contour 0.6548
* Correlated with Tragion to Subnasale Contour 0.8902
* Correlated with Tragion to Tragion Contour 0.9540
* Correlated with Tragion to Tragion Linear 0.7114
* 31 missing values
* intraRR coder A: 0.993
* intraRR coder B: 0.990
* intraRR coder C: 0.993
* intraRR coder D: 0.732
* interRR: 0.866
* not included in Zhaung PCA panel
* not considered important for respirator fit ISO committee
* Would be good to include, but highly correlated with Tragion to Tragion contour

**Tragion to Submandibular Contour (TrSman\_C) – INCLUDE**

* No correlations over 0.75
* Correlated somewhat with Tragion to Sellion 0.6548
* Tragion to Subnasale Contour 0.7238
* Tragion to Tragion Contour 0.6719
* Tragion to Tragion Linear 0.6826
* 132 missing values (6.5%)
* intraRR coder A: 0.993
* intraRR coder B: 0.997
* intraRR coder C: 0.965
* intraRR coder D: 0.907
* interRR 0.949
* not included in Zhaung PCA panel
* not considered important for respirator fit ISO committee
* novel measure that helps contextualize face length, good RR numbers, no correlations over 0.75

**Tragion to Subnasale Contour (TrSnas\_C) – DROP**

* Correlated with Tragion to Sellion 0.8902
* Correlated with Tragion to Submandibular 0.7238
* Correlated with Tragion to Tragion Contour 0.8753
* Correlated with Tragion to Tragion Linear 0.7053
* 71 missing values
* intraRR coder A 0.971
* intraRR coder B 0.988
* intraRR coder C 0.983
* intraRR coder D 0.740
* interRR 0.958
* not in Zhaung PCA panel
* not considered important for respirator fit ISO committee
* probably not important to include instead of Tragion to Tragion Contour

**Tragion to Tragion Contour (TrTr\_C) – INCLUDE**

* Correlated with Tragion Sellion Contour 0.9540
* Correlated with Tragion Submandibular 0.6719
* Correlated with Tragion Subnasale 0.8753
* Correlated with Tragion to Tragion Linear 0.7414
* 38 missing values
* IntraRR coder A 0.997
* intraRR coder B 0.989
* intraRR coder C 0.993
* intraRR coder D 0.932
* interRR 0.958
* linear version included in PCA panel, but NOT considered important for respirator fit by ISO committee
* Could include both this and linear version bc they are not highly highly correlated

**Tragion to Tragion Linear (TrTr\_L) - INCLUDE**

* Not correlated more than 0.75 with any other measure
* Correlated with Tragion to Sellion Contour 0.7114
* Correlated with Tragion to Submandibular Contour 0.6826
* Correlated with Tragion to Subnasale Contour 0.7053
* Correlated with Tragion to Tragion Contour 0.7414
* 34 missing values
* IntraRR coder A 0.998
* IntraRR coder B 0.992
* IntraRR coder C 0.995
* intraRR coder D 0.995
* interRR 0.989
* average between 14-15cm (vs contour average is high 20s)
* linear version included in PCA panel, but NOT considered important for respirator fit by ISO committee