Facial Imagery BMI Algorithm correlates with Normal and Overweight Measured BMI

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BACKGROUND

Identifying non-invasive and quick ways to measure an individuals Body Mass Index (BMI) is useful in research and health care. BMI is a global measure used to determine health of an individuals and it's utilization is widely accepted. However, because taken an individual's weight is a sensitive matter, a better and more efficient method is needed.

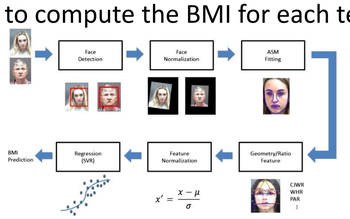
OBJECTIVE

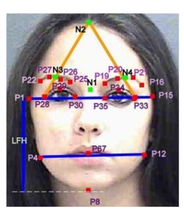
The objective of this research was to **determine a better method for capturing BMI** of an individual. Through a facial photograph, researchers would determine if an algorithm could determine BMI.

METHODS

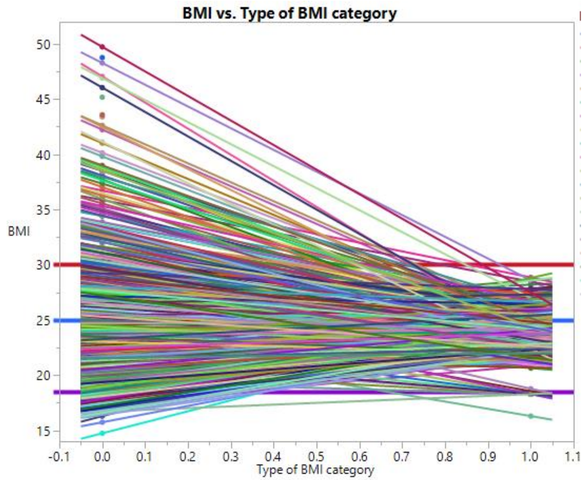
Sample of 1,210 young adults, as a part of a larger study, with a facial image and objective height and weight were used for analysis.

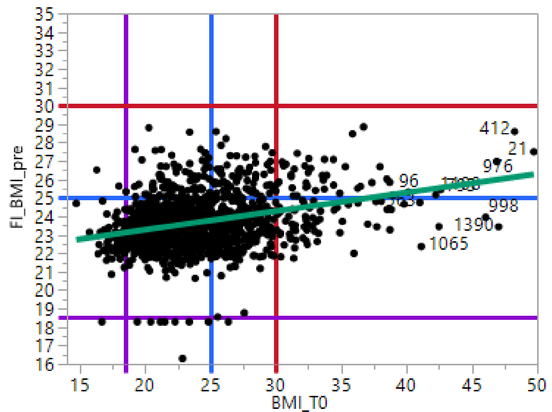
- **Measured BMI (mBMI)** was calculated by weight in kilograms divided by height in meters squared
- **Facial BMI (fBMI)** was measured through
- Algorithm formulated to identify points on each face located in L.Wen and G-D. Guo, in *Image and Vision Computing*, Vol. 31, Issue 5, pages 392-400, 2013. Given the detected facial landmarks **20 facial points** are used as the features to characterize the facial fatness. The learned function can then be used to compute the BMI for each test face image.





RESULTS





There is less sensitivity of the algorithm to underweight and obese individuals. Contingency table analysis indicted 109 participants in the 3rd category of mBMI were placed into a lower category for fBMI.

Matched pairs data for each individual, there was a range of 14.73-49.74 for mBMI and a narrowed spread for fBMI (range = 16.29-28.85) indicating that fBMI detected participant BMI 0.4212 less than mBMI (p<.0004)

BMI Category	mBMI (n)	fBMI (n)
< 18.5	70	10
18.5-24.9	728	991
25.0-29.9	303	209
>30	109	0

Count Total % Col % Row %	0	1	2	Total
0	1 0.08 10.00 1.43	67 5.54 6.76 95.71	2 0.17 0.96 2.86	70 5.79
1	8 0.66 80.00 1.10	632 52.23 63.77 86.81	88 7.27 42.11 12.09	728 60.17
2	1 0.08 10.00 0.33	228 18.84 23.01 75.25	74 6.12 35.41 24.42	303 25.04
3	0 0.00 0.00 0.00	64 5.29 6.46 58.72	45 3.72 21.53 41.28	109 9.01
Total	10 0.83	991 81.90	209 17.27	1210

CONCLUSION

This method designed by researchers has the capabilities to identify BMI of individuals rather closely. **Healthy young adults or those within the healthy range of BMI**, the facial imagery procedure could be used. However, the algorithm **is less sensitive to the extreme BMIs of underweight and obese**. Future work is being done on the algorithm with these facial images and a new cohort to **improve sensitivity**.

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