Response to Reviewer 4 Comments

Point 1: I wish to thank the authors for the opportunity to review their work.

This article presents a tool that helps pregnant women to simulate their 3D-body shapes, basing on height, weight and gestational age. The tool was validated by users by means of a survey, and several linear regression studies seem to have been made.

The article is interesting and original, and presentation is ok, but the authors do not explain which statistical tools they are using for the study, and therefore the scientific soundness is below-average. I would recommend to make several important changes to it before it could be published:

Response 1: We would like to thank the reviewer for your kind words and encouragement. We have provided more details on the statistical tool and updated several important changes to the manuscript accordingly to your comments.

General comments:

Point 2: English should be deeply revised by a native English speaker, it is sometimes difficult to understand some parts of the manuscript.

Response 2: Thanks for your advice, we will submit the manuscript to editing services (MDPI Author Services) for revisions by native English-speaker in minor revision after completing major revision correction.

Point 3: More information about how the tool was developped should be included, it remains unclear how the depictions of bodies were created and shown on the site, how was the application programmed, etc.

Response 3: Thanks for your comment, we have explained more about how the proposed tool was developed in the methodology section as follows:

"The real-time visualization of 3D morphing of pregnant and postpartum female body shapes on the online Z-Size Ladies web application was implemented using the three.js library [47] incorporated with HTML5, JavaScript, and CSS for client-side development. Python, flask, and MySQL were employed for the server-side. Three.js was used because it was a cross-browser JavaScript library to ease the process of creating and displaying real-time 3D computer graphics and animation in the web browser."

"The idea of utilizing a combination of the avatar bodies for 3D shape simulation came from the morphing technique [50]. Morphing is a geometric interpolation technique, which mixed different characteristics of the objects. The body shape simulation that adjusted only a specific part was a challenge. For example, chest or hip circumference could be set bigger or smaller with the least impact on the waist and others. Therefore, our team designed the avatars in different ways to combine the shape of the body and to be able to adjust the size of specific parts as needed. Therefore, the 3D normal female shape was created by combining thin, big breast, big waist, big hip, tall and long legs avatars using the morphing technique to make it easier to adjust only specific part of the body."

Reference

[47] : Three JS, 2018. Available online at: https://threejs.org/

[50] Kang J.Y., Lee B.S., Application of morphing technique with mesh-merging in rapid hull form generation, International Journal of Naval Architecture and Ocean Engineering, Volume 4, Issue 3, 2012, Pages 228-240, DOI: 10.2478/IJNAOE-2013-0092.

Point 4: Statistical study needs to be better explained, indicating which statistical software was used, how were correlations calculated, which were the confidence intervals, etc.

Response 4: The short explanation of the statical study and tools used were mentioned with a short explanation of how correlations were calculated in Section 3.2.

"Wendland et al. [43] investigated the relationship between waist circumference and obesity-related pregnancy. The variables used in the correlation analysis were age, height, gravida, gestational age, uterine height, gestational BMI, and pre-pregnancy BMI. Similar work by Ricalde et al. [44], reported that some postpartum women's anthropometric was related to birth weight. Therefore, in this pregnancy study, the relationships between the body shape proportion and variables of pregnancy such as woman's age, weight, height, gestational age, weight gain during pregnancy were analyzed using multiple linear regression which could be calculated in Excel [45] as shown in equation (1)."

[43] Wendland E.M., Duncan B.B., Mengue S.S., Nucci L.B., & Schmidt M. (2007). Waist circumference in the prediction of obesity-related adverse pregnancy outcomes. Cadernos de saude publica, 23 2, 391-8. DOI:10.1590/S0102-311X2007000200015

[44] Ricalde, A.E., Velásquez-Melendez, G., Tanaka, A.C., & de Siqueira, A.F. (1998). Mid-upper arm circumference in pregnant women and its relation to birth weight. Revista de saude publica, 32 2, 112-7. DOI:10.1590/S0034-89101998000200002

[45] Cameron A.C. EXCEL 2007: Multiple Regression, 2007. Available online at http://cameron.econ.ucdavis.edu/excel/ex61multipleregression.html

Table 11-14, 95% confidence interval (lower and upper) and the relative error in the 3rd-5th rows were added. A plot of confidence intervals chart was also shown in Figure 7-10.

Specific comments:

Point 5: L6-21- All authors seem to have the same affiliation, I would recommend to indicate it just by a single number (1). Also, usually only corresponding author e-mail is included, but if the authors want to include every e-mail address, I would recommend to put them at the end of the line in the same order as the authors appear above.

Response 5: The affiliations have been revised as follows.

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Point 6: L24 – BMI has not been defined before, please indicate the meaning of every abbreviation first time it appears.

Response 6: We have defined BMI and other abbreviations the first time it appears.

Point 7: L40 – A citation would be needed to support such a strong statement.

Response 7: We revised the sentence and added citations following the reviewer's suggestion:

"Obesity during pregnancy is a serious health problem for women. Worldwide, obstetricians and midwives have confronted an increase in obesity among pregnant women [1, 2]."

[1] Poston, L., Harthoorn, L., van der Beek, E. et al. Obesity in Pregnancy: Implications for the Mother and Lifelong Health of the Child. A Consensus Statement. Pediatr Res 69, 175–180 (2011). DOI: 10.1203/PDR.0b013e3182055ede

[2] Chen C, Xu X, Yan Y. Estimated global overweight and obesity burden in pregnant women based on panel data model. PLoS One. 2018 Aug 9;13(8):e0202183. DOI: 10.1371/journal.pone.0202183.

Point 8: L41-43 – Those reports should be cited.

Response 8: Thank you for your comment, those reports were cited as follows:

"Reports [3, 4, 5] showed that women with a pre-pregnant body mass index (BMI) of either overweight or obese levels are at risk of developing diabetes during pregnancy compared to women with normal pre-pregnant BMI, even after taking the weight gains during a normal pregnancy into account."

References:

[3] Black K.I., Schneuer F., Gordon A., Ross G.P., Mackie A., Nassar N. Estimating the impact of change in pre-pregnancy body mass index on development of Gestational Diabetes Mellitus: An Australian population-based cohort. Women and Birth, 2022, DOI: 10.1016/j.wombi.2021.12.007.

[4] Persson M, Pasupathy D, Hanson U, et al. Pre-pregnancy body mass index and the risk of adverse outcome in type 1 diabetic pregnancies: a population-based cohort study. BMJ Open 2012;2:e000601. DOI: 10.1136/bmjopen-2011-000601

[5] Heude B, Thiébaugeorges O, Goua V, et al. Pre-pregnancy body mass index and weight gain during pregnancy: relations with gestational diabetes and hypertension, and birth outcomes. Matern Child Health J. 2012;16(2):355-363. DOI:10.1007/s10995-011-0741-9

Point 9: L50-52 – A citation would be needed to support this statement.

Response 9: We have updated the sentence with the citations to support as follows:

"It was reported that if a woman in the postpartum period was unable to regulate her weight to her pre-pregnant weight within six months, postpartum weight retention could predict future weight gain and long-term obesity [10]. Another study suggested that the BMI of a woman of more than six months postpartum would indicate the retaining extra body fluids produced during pregnancy, as well as extra fat during the first six months postpartum [11]."

[10] van der Pligt P, Willcox J, Hesketh KD, Ball K, Wilkinson S, Crawford D, Campbell K. Systematic review of lifestyle interventions to limit postpartum weight retention: implications for future opportunities to prevent maternal overweight and obesity following childbirth. Obes Rev. 2013 Oct;14(10):792-805. DOI: 10.1111/obr.12053.

[11] Arizona WIC (Women Infant and Children) Nutrition Care Guidelines: Breastfeeding and Postpartum Women, 2015. Available online at: https://azdhs.gov/documents/prevention/azwic/face-to-face/2015/jan/6-Breastfeeding-and-Postpartum-Women.pdf

Point 10: L64 – SizeThailand term should be better explained . Is it an Institution, a NGA, a website…?. Same with SizeUSA in L76

Response 10: We have explained about SizeThailand with the citation.

"Then data were analysed and processed to create simulation of 3D modelling of pregnant and postpartum women based on data of non-pregnant female shapes from SizeThailand [19, 20]."

"SizeThailand is a national sizing surveys project among 13,442 adults, both males, and females across Thailand at various ages [30]."

References

[19] Wells, J., Treleaven, P. & Charoensiriwath, S. Body shape by 3-D photonic scanning in Thai and UK adults: comparison of national sizing surveys. Int J Obes 36, 148–154 (2012). DOI: 10.1038/ijo.2011.51

[20] Wells JC, Charoensiriwath S, Treleaven P. Reproduction, aging, and body shape by three-dimensional photonic scanning in Thai men and women. Am J Hum Biol. 2011 May-Jun;23(3):291-8. DOI: 10.1002/ajhb.21151.

[30] SizeThailand (In Thai). Available online at http://www.sizethailand.org/

Point 11: L82-83 – "Z-Size Ladies v.1 database" should be cited or better explained.

Response 11: We have revised the paragraph as follows:

"The body shape proportion of pregnancy and postpartum women were analysed using linear regression of 587 pregnancy data and 503 postpartum data. The simulations of pregnant and postpartum women were further modified based on non-pregnant simulation from our previous study which was analysed from the SizeThailand database with 6,767 females' data [19, 20]."

References

[19] Wells, J., Treleaven, P. & Charoensiriwath, S. Body shape by 3-D photonic scanning in Thai and UK adults: comparison of national sizing surveys. Int J Obes 36, 148–154 (2012). DOI: 10.1038/ijo.2011.51

[20] Wells JC, Charoensiriwath S, Treleaven P. Reproduction, aging, and body shape by three-dimensional photonic scanning in Thai men and women. Am J Hum Biol. 2011 May-Jun;23(3):291-8. DOI: 10.1002/ajhb.21151.

Point 12: L96 – MRI acronym should be explained the first time it appears.

Response 12: Magnetic Resonance Imaging (MRI) has been added to the MRI acronym.

Point 13: L208 – "Turbosquid" reference should be cited or better explained.

Response 13: The term of Turbosquid is explained as follows:

"TurboSquid is a digital media company that sells 3D models used in 3D graphics to a variety of industries, including computer games, architecture, and interactive training [48, 49]."

Reference

[48] Turbosquid: Pregnant Woman by MotionCow. Available from: https://www.turbosquid.com/3d-models/pregnant-woman-pregnancy-3d-max/693351 [Accessed 15th December 2018].

[49] Turbosquid. 3D Models for Professionals. Available from: https://www.turbosquid.com/ [Accessed 15th December 2018].

We have carefully consolidated the manuscript and sent it to the Professional Authorship Center, Thailand National Science and Technology Development Agency (NSTDA) for review and revision.



CERTIFICATE OF ENGLISH EDITING

This document certifies that the manuscript listed below was edited for English language by one of the highly qualified English editors with a Ph.D. at Professional Authorship Center (PAC), National Science and Technology Development Agency (NSTDA).

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