OPEN

PRS GLOBAL OPEN

ORIGINAL ARTICLE

Cosmetic

Physical and Visual Characteristics of the Neck Predicting Gender Perception

Ofer Amir, PhD*†
Kim Shemer, MA*†
Ilan Roziner, PhD*†
Adi Primov-Fever, MD†‡

Background: The association between neck characteristics (physical and visual) and the perception of gender is unclear. This association is critical, especially when the perception of the speakers' gender is of interest, such as in transgender patients. This study was the first to provide basic empirical data on this association among cisgender men and women.

Methods: The necks of 30 adult men and women were measured physically and then photographed and evaluated visually by a group of 10 judges. These judges also evaluated voice recordings of the same speakers. Another group of 124 judges rated the visual and auditory masculinity/femininity of the necks and the voices.

Results: While most physical measures of the neck were larger for men, neck-length did not significantly differ between genders. A stepwise multiple regression model revealed that the single *physical* measure that consistently differed between genders was neck-girth ($P < 0.0001$). The single *visual-appearance* measure that consistently differed between genders was thyroid-protrusion ($P = 0.0003$). Neck-girth was the only physical characteristic that significantly correlated with gender differences in voice. Furthermore, the size of the thyroid prominence (ie, Adam's apple) was not associated with gender differences in voice.

Conclusions: Neck characteristics (both physical and visual) are significantly associated with the perception of gender. While larger necks are typically perceived as masculine, *neck-length* is neither associated with gender nor with the speaker's voice characteristics. These findings highlight the importance of examining various physical and visual characteristics of the neck, when considering a feminization confirmation procedure for transgender patients. *(Plast Reconstr Surg Glob Open 2019;7:e2573; doi: 10.1097/GOX.0000000000002573; Published online 30 December 2019.)*

INTRODUCTION

Chondrolaryngoplasty has become a common procedure in recent years, for transgender women. In this procedure, the thyroid prominence (Adam's apple), which is considered a masculine marker, is reduced (shaved) to change the appearance of the neck and match the feminine persona of the transgender patient.[1,2] This is considered one of the important facial feminization procedures, available to female transgenders,[3,4] primarily as a reconstructive procedure, rather than merely a cosmetic procedure.[5] Yet, while this procedure is highly successful surgically in most cases, only 60% of patients report high satisfaction with the procedure, and 13% report to be "not at all" satisfied.[1] Moreover, 25% of the patients complain that their neck still appears "moderately" or "very" masculine after the procedure. This report, which is in agreement with our clinical experience, has motivated us to directly examine the effect of neck characteristics (both physical and visual) on the perception of the speaker's gender. In this context, it was deemed desirable to examine the effect of various characteristics of the neck on the perception of gender, rather than only considering the thyroid prominence alone. This was done under the assumption that additional features of the neck could contribute and affect gender perception.

It should be noted that, in contrast to the abundance of studies on the association between *laryngeal* characteristics

*Department of Communication Disorders, The Stanley Steyer School of Health Professions, Tel-Aviv University, Tel-Aviv, Israel; †Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel; and ‡Department of Otolaryngology and Head and Neck Surgery, Sheba Medical Center, Tel Hashomer, Israel.

Received for publication August 21, 2019; accepted October 18, 2019.

DOI: 10.1097/GOX.0000000000002573

Disclosure: *The authors have no financial interest to declare in relation to the content of this article.*

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

and gender perception, the data on gender differences in *neck* characteristics are scarce. For example, in one study, no significant gender differences were found between men and women in vertebral shape or kinematic measures, and only total neck muscle volume was found to be larger in men [6]. Yet another study, which matched pairs of men and women for height and neck length, concluded that the female neck is not simply a scaled version of male neck. Instead, the 2 genders were shown to exhibit different geometrical configurations of the neck, beyond the obvious size difference [7]. Nonetheless, no previous study has examined how these differences in neck configuration affect gender perception.

Much like the thyroid prominence, voice is also considered an important secondary sex characteristic. Numerous studies have documented gender differences between the voices of men and women. The 2 most prominent differences between the voices of men and women are in fundamental frequency (perceived as vocal pitch) and formant frequencies (ie, vocal resonance). While men's mean fundamental frequency (f0) typically ranges between 107 and 132 Hz, for women it ranges between 196 and 224 Hz.[8,9] Interestingly, voices with intermediate values of f0 (eg, between 145 and 165 Hz) are not unanimously assigned by listeners to either gender, but are judged as "gender ambiguous."[10] Formant frequencies are also different between men and women, as men exhibit lower values than women and a narrower frequency gap between neighboring formants.[11,12] These gender-related acoustic differences are mainly the product of the physical differences between men and women in vocal folds' size[13] and in vocal tract's length and shape.[14] Hence, this study aimed to examine how the physical and visual characteristics of the neck govern the perception of the speaker's gender and whether these characteristics are also associated with the speaker's voice.

METHODS

The study was conducted after receiving the approval of the Tel-Aviv University Ethics Committee and after all participants had completed and signed an informed consent form.

Physical and Visual Stimuli

Fifteen men and 15 women (mean age: 26.8; range: 18–33) with no speech or hearing problems and with no reported medical history volunteered to participate in the study. *Physical properties* of the participants' necks were measured following the scheme described by Kohn and Wirth.[15] In essence, measurements were taken of neck-girth (at thyroid and cricoid level); length (lateral and frontal); and diameter/width (coronal, sagittal at thyroid level, and sagittal at cricoid level). In addition, thyroid-protrusion was calculated as the difference between thyroid-level and cricoid-level sagittal diameters. Girth and length measurements were taken using a measuring tape, while width measurements were taken using a 0–8″ digital diameter inside calipers (iGaging, San Clemente, Calif.).

Two photographs (at 0- and 90-degree angles) of each neck were taken while wearing a white face mask and a round collar T-shirt, to ensure that only the neck was visible. High resolution black-and-white photos were taken using a Canon EOS1100D camera with an EF55-250-mm lens, situated on a tripod, with constant lighting and background. All men were asked to shave closely before the photography session. Examples of neck photographs are presented in Supplemental Digital Content 1 (see figure, Supplemental Digital Content 1, which displays examples of neck photographs used in this study, taken at 0- and 90-degree angles. Images 1a–1d were taken from men, and images 1e–1h were taken from women, http://links.lww.com/PRSGO/B272).

Acoustic Stimuli

All participants were also recorded using a Sennheiser PC-20 headset microphone connected to a Xenyx 302 external sound card, onto a computer with a sampling rate of 48 kHz (16 bit). Recordings were performed while the speakers produced 10 isolated repetitions of the vowel /a/, and while reading the phonemically balanced "Thousand Islands" Hebrew reading passage.[16] Acoustic analysis was performed using the Praat software (ver. 6.0.30),[17] and consisted of the following measures: (1) mean *fundamental frequency* (f0) for each sentence and for each isolated vowel, and (2) mean *frequency of the first two formants* (F1 and F2) extracted from the isolated /a/ vowels.

Visual Appearance Evaluation

Ten untrained judges (5 men and 5 women, mean age: 29.3 years, with diverse professional background and education level) rated the *visual appearance* of all 60 photographs (30 necks × 2 angles) on 6 dimensions, using 7-point rating scales. These scales included: (1) hairiness, (2) skin smoothness, (3) neck length, (4) neck thickness, (5) protrusion of thyroid, and (6) general appearance. Inter-judge reliability was assessed, and it was found that 2 judges' ratings undermined reliability. After excluding these judges' scores, the reliability (Cronbach's alpha coefficient) ranged from 0.50 to 0.95 for the different photographs, with only a single coefficient lower than the accepted minimum of 0.60 and with the median of 0.88.

Gender Perception

A group of 124 untrained judges (53 men and 71 women, mean age: 28.5 years, with diverse professional background and education level) rated the 60 photographs (ie, visually) and the 30 recordings (ie, auditory) in a random order, using 3 scales. The first question was "Rate the extent of *masculinity* of this neck/voice" (1 = "not masculine at all" to 5 "very masculine"); the second question was "Rate the extent of *femininity* of this neck/voice?" (1 = "not feminine at all" to 5 "very feminine"); and the third question was "Rate the extent of *masculinity or femininity* of this neck/voice?", using a 7-point rating scale (1 = "very feminine" to 7 "very masculine"). Preliminary analyses revealed that these 3 scales were highly inter-correlated, with median Cronbach's alpha of 0.90 for neck, and of 0.72 for voice judgments. Therefore, they were averaged into a single scale. As the differences between the scales (5 versus 7 points) did not affect the reliability coefficients, raw scores were used in averaging. Accordingly, the resulting score ranged between 1, representing maximal "masculinity," and 5.67, representing maximal "femininity," with 3.33 representing the mid (neutral) point.

Statistical Analyses

All statistical analyses were performed using SAS/STAT software (v.9.4). The research variables were described using means and SDs. Differences in means between male and female necks were assessed with *t*-tests. Univariate relations between research variables were expressed as Pearson correlation coefficients, and multivariate relations were estimated as linear regression models. To avoid inflation of Type I error, an FDR correction [18] was used, with experiment-wise error set at 0.05.

RESULTS

Physical and Visual Measures

Compared with women, men exhibited larger mean neck size on all measures (Table 1). Specifically, men's neck-girth measurements were larger than those of the women by 17%–18%. Similarly, men's necks were ~11% longer than those of the women. Neck-width was 20%–24% larger for men, and thyroid-protrusion measurements were ~126% larger in men. Perceptually, women's necks were assessed as more feminine than men's at both photographed angles. After correcting for multiple comparisons, these gender differences were statistically significant for most measures, except for the 2 length measures, which failed to reach statistical significance.

All physical measures, except for "length," were negatively correlated with gender ratings (Table 2), indicating that larger values were more typical of men. Similarly, most visual (ie, perceptual) measures were significantly correlated with gender, indicating that necks rated as more feminine were also rated as less hairy, smoother, less thick, and with a lesser thyroid protrusion. In contrast with all other physical and visual measures, neck-length was not significantly correlated with gender ratings. Similar findings were obtained from photographs taken at both 0 and 90-degree angles.

The simultaneous contribution of the physical and visual measures, which were significantly related to gender rating of the neck photos at 0-degree angle, was tested using a stepwise multiple regression model. Only 2 independently contributing predictors were left in the model. These included a single physical measure: $\text{Girth}_{(\text{thyroid})}$ ($\beta = -0.61$, $P < 0.0001$), and a single visual measure: thyroid-protrusion ($\beta = -0.43$, $P < 0.0001$), that together explained 86.0% of the rating variance. In the parallel model for photos at 90-degree angle, no physical measure was left in the model, whereas 2 visual appearance measures contributed significantly: Skin-smoothness ($\beta = 0.40$, $P = 0.0005$), and thyroid-protrusion ($\beta = -0.61$, $P < 0.0001$), which together explained 84% of the variance.

Prediction of Voice Gender Ratings by Physical and Visual Measures

Table 3 presents a summary of the relations between the physical and visual measures to the voice measures. As shown, all physical measures, except "length," were negatively correlated with the acoustic measures and with the voice gender ratings. Similar findings were found for the measures in the "visual appearance" category.

Results of the acoustic analysis, as well as the comparison between the voices of men and women are presented and briefly explained in the appendix.

Finally, all measures in the "physical properties" and "visual appearance" categories that were found to

Table 1. Means and SDs of Physical Properties, Visual Appearance, and Gender Ratings of Men's and Women's Necks

Measure	Men (N = 15)	Women (N = 15)	*t* value
Physical properties, mm			
Girth (thyroid)	375.70 ± 14.18	318.06 ± 15.91	10.47*
Girth (cricoid)	372.99 ± 13.73	319.00 ± 16.50	9.74*
Neck length (lateral)	126.62 ± 13.03	113.57 ± 17.77	2.29
Neck length (frontal)	130.27 ± 14.58	117.28 ± 18.40	2.14
Neck width (coronal)	118.53 ± 10.60	96.73 ± 7.89	6.39*
Neck width (sagittal—thyroid level)	120.32 ± 9.94	97.22 ± 7.26	7.27*
Neck width (sagittal—cricoid level)	113.51 ± 9.14	94.20 ± 7.52	6.32*
Thyroid protrusion	6.81 ± 2.83	3.02 ± 2.81	3.68*
Visual appearance (7-point scale)			
Hairiness (0-degree angle)	3.81 ± 1.24	1.86 ± 0.66	5.38*
Hairiness (90-degree angle)	4.46 ± 0.69	2.72 ± 0.98	5.63*
Skin smoothness (0-degree angle)	3.41 ± 1.02	5.10 ± 0.85	4.95*
Skin smoothness (90-degree angle)	2.93 ± 0.42	4.43 ± 0.52	8.75*
Neck length (0-degree angle)	4.06 ± 0.90	4.15 ± 1.27	0.23
Neck length (90-degree angle)	4.94 ± 0.83	5.01 ± 0.84	0.22
Neck thickness (0-degree angle)	4.51 ± 0.58	3.55 ± 0.80	3.76*
Neck thickness (90-degree angle)	4.19 ± 0.44	3.70 ± 0.46	3.00*
Thyroid protrusion (0-degree angle)	3.80 ± 0.96	2.19 ± 0.97	4.57*
Thyroid protrusion (90-degree angle)	4.82 ± 1.59	2.35 ± 0.66	5.55*
General appearance (0-degree angle)	4.67 ± 0.58	5.14 ± 0.65	2.11
General appearance (90-degree angle)	4.09 ± 0.40	4.69 ± 0.62	3.97*
Mean neck gender (femininity) rating			
Photograph at 0-degree angle	2.37 ± 0.46	4.00 ± 0.41	10.23*
Photograph at 90-degree angle	1.70 ± 0.48	3.17 ± 0.67	6.92*

*FBR-corrected $P < 0.05$.

Table 2. Prediction of Necks Gender Ratings by Their Physical and Visual Properties (Pearson Correlation Coefficients, N = 30)

Predictor	Neck Gender Ratings At 0-degree Angle	Neck Gender Ratings At 90-degree Angle
Neck physical properties		
Girth (thyroid)	−0.86*	−0.73*
Girth (cricoid)	−0.84*	−0.70*
Neck length (lateral)	−0.40	−0.39
Neck length (frontal)	−0.43	−0.40
Neck width (coronal)	−0.74*	−0.63*
Neck width (sagittal - thyroid level)	−0.78*	−0.69*
Neck width (sagittal - cricoid level)	−0.74*	−0.61*
Thyroid protrusion	−0.56*	−0.65*
Neck visual appearance		
Hairiness	−0.81*	−0.70*
Skin smoothness	0.78*	0.80*
Neck length	−0.01	−0.13
Neck thickness	−0.61*	−0.48*
Thyroid protrusion	−0.79*	−0.87*
General appearance	0.46	0.65*

* FBR-corrected $P < 0.05$

significantly predict the acoustic measures (Table 3) were entered into a stepwise multiple regression model, for each acoustic measure. In the 4 models for the prediction of f0-sentence, f0-/a/, F1-/a/, and F2-/a/, the single predictor that contributed independently and significantly to the model was $\text{Girth}_{(\text{thyroid})}$ ($\beta = -0.89, -0.86, 0.80, -0.85$, respectively, $P < 0.0001$). The model for prediction of voice gender-rating included 2 variables: $\text{Girth}_{(\text{thyroid})}$ ($\beta = -0.75$, $P < 0.0001$) and thyroid protrusion at 90-degree angle ($\beta = -0.26$, $P = 0.006$).

DISCUSSION

This study was the first to examine the association between the physical and visual characteristics of the neck and the perception of the speakers' gender. As expected, all measurements of the men's necks were larger than those of the women. The only exception was neck-length that did not differ between genders. Interestingly, when all visual and physical measures were combined into the statistical model (simulating the way listeners perform when assessing speaker's gender in the "real world"), judges based their assessment of gender (ie, femininity versus masculinity) on 3 factors alone: neck-girth, thyroid-protrusion, and skin-smoothness. This finding provides the first empirical support to the clinical merit of chondrolaryngoplasty ("shaving" of the Adam's apple), when there is a need to modify the way the speaker's gender is perceived.[1–4] On the other hand, our result can also be interpreted as an explanation to the fact that some transgender women are not satisfied with the appearance of their neck, even after a successful chondrolaryngoplasty procedure. While the thyroid protrusion is an important masculine marker, the typical female neck is different from that of the men's in additional properties that are not modified in chondrolaryngoplasty. This should be discussed with the patient when considering the procedure, to ensure realistic expectations and eventual satisfaction.

It should be noted that the present study examined a long list of physical, visual, and acoustic measures. Statistical analyses have shown that many of these measures were ultimately redundant in the context of gender perception. Therefore, it appears that for clinical purposes, fewer measures may be considered, when the perception of gender is of interest. These measures should include neck-girth and thickness, as well as the size of the thyroid-protrusion, since these were shown to predict gender perception reliably.

Finally, the present study was the first to demonstrate the association between *neck* characteristics and voice, and to examine how this association affects the perception of gender. Two interesting and novel findings have emerged. First, "neck-length" was not associated with lower fundamental frequency (f0), unlike most other physical

Table 3. Prediction of Acoustic Measures and Gender Ratings of the Necks, Based on Their Physical Properties and Visual Appearance Ratings (Pearson Correlation Coefficients) (N = 30)

Predictor		F0; Sentences	F0; /a/	F1; /a/	F2; /a/	Voice Gender Rating
Neck physical properties						
Girth (thyroid)		−0.88*	−0.86*	−0.77*	−0.85*	−0.91*
Girth (cricoid)		−0.84*	−0.84*	−0.75*	−0.82*	−0.89*
Neck length (lateral)		−0.31	−0.29	−0.45	−0.37	−0.40
Neck length (frontal)		−0.30	−0.26	−0.53*	−0.43	−0.38
Neck width (coronal)		−0.83*	−0.80*	−0.66*	−0.77*	−0.80*
Neck width (sagittal—thyroid level)		−0.86*	−0.82*	−0.72*	−0.79*	−0.83*
Neck width (sagittal—cricoid level)		−0.82*	−0.78*	−0.67*	−0.76*	−0.79*
Thyroid protrusion		−0.58*	−0.55*	−0.53*	−0.49*	−0.58*
Neck visual appearance ratings						
Hairiness	0-degree	−0.70*	−0.67*	−0.63*	−0.62*	−0.73*
	90-degree	−0.76*	−0.75*	−0.68*	−0.71*	−0.74*
Skin smoothness	0-degree	0.68*	0.65*	0.65*	0.64*	0.70*
	90-degree	0.82*	0.81*	0.81*	0.78*	0.85*
Neck length	0-degree	0.09	0.06	0.13	0.20	0.03
	90-degree	0.12	0.11	−0.02	0.04	0.02
Neck thickness	0-degree	−0.55 *	−0.54*	−0.55*	−0.61*	−0.58*
	90-degree	−0.48*	−0.44	−0.52*	−0.35	−0.47*
Thyroid protrusion	0-degree	−0.56*	−0.54*	−0.50*	−0.51*	−0.65*
	90-degree	−0.64*	−0.62*	−0.59*	−0.59*	−0.71*
General appearance	0-degree	0.33	0.32	0.48*	0.39	0.38
	90-degree	0.60*	0.60*	0.61*	0.65*	0.63*

* FBR-corrected $P < 0.05$

and visual measures. This indicates that voice masculinity is indeed associated with a "larger" neck, but not with its length. The second important finding was that although the thyroid-protrusion is an important visual gender marker; it was not associated with the acoustic properties of the voice. This demonstrates that the Adam's apple is important for visual perception of gender, but it is not associated with the speaker's voice or pitch. Since the association between vocal folds' length and f0 is well established in the literature, this finding also indicates that larger vocal folds are physically associated with neck-width and girth, but not with the size of the Adam's apple. Nonetheless, as vocal folds' size was not examined here directly, future research could further address this relationship.

CONCLUSIONS

This study was the first to examine the association between neck characteristics, voice and the perception of gender. In accordance with previous reports, larger necks were generally perceived as more masculine. However, neck length did not affect subjective gender perception. In addition, the thyroid-protrusion (ie, Adam's apple) was shown to be an important gender marker, although it was not associated with voice differences between genders. Beyond the theoretical value of these findings, they may improve personalizing treatment and clinical decision-making, in cases where gender perception is of interest. Accordingly, patients should be informed preoperatively on factors that can and cannot be modified, to ensure realistic expectations, and increase patient's eventual satisfaction.

Ofer Amir, PhD
Department of Communication Disorders
Tel Aviv University, Sheba Medical Center
Tel-Hashomer, 52621, Israel
E-mail: oferamir@tauex.tau.ac.il

REFERENCES

1. Cohen MB, Insalaco LF, Tonn CR, et al. Patient satisfaction after aesthetic chondrolaryngoplasty. *Plast Reconstr Surg Glob Open.* 2018;6:e1877.
2. Lipschitz N, Wolf M, Amir O, Sagiv D, Primov-Fever A."Thyroid chondroplasty" smooting the thyroid cartilage - a retrospective study of thyroid chondroplasty for feminine neck appearance. *Int J Transgen.* 2017;18:389–394.
3. Morrison SD, Vyas KS, Motakef S, et al. Facial feminization: systematic review of the literature. *Plast Reconstr Surg.* 2016;137:1759–1770.
4. Safa B, Lin WC, Salim AM, et al. Current concepts in feminizing gender surgery. *Plast Reconstr Surg.* 2019;143:1081e–1091e.
5. Laungani A, Brassard P. Gender confirmation surgery: cosmetic or reconstructive procedure? *Plast Reconstr Surg Glob Open.* 2017;5:e1401.
6. Zheng L. *Sex Differences in Human Neck Musculoskeletal Biomechanics and Modeling.* Pullman, WA: Washington State University; 2011.
7. Vasavada AN, Danaraj J, Siegmund GP. Head and neck anthropometry, vertebral geometry and neck strength in height-matched men and women. *J Biomech.* 2008;41:114–121.
8. Dacakis G. Long-term maintenance of fundamental frequency increases in male-to-female transsexuals. *J Voice.* 2000;14:549–556.
9. Simpson AP. Phonetic differences betrween male and female speech. *Lang Ling Comp.* 2009;3:621–640.
10. Oates J, Dacakis G. Voice change in transsexuals. *Venereol.* 1997;10:178.
11. Hillenbrand JM, Clark MJ. The role of f (0) and formant frequencies in distinguishing the voices of men and women. *Atten Percept Psychophys.* 2009;71:1150–1166.
12. Most T, Amir O, Tobin Y. The hebrew vowel system: raw and normalized acoustic data. *Lang Speech.* 2000;43(Pt 3):295–308.
13. Hirano M. The structure of the vocal folds. In: Stevens K, Hirano M, eds. *Vocal Folds Physiology.* Tokyo, Japan: University of Tokyo; 1983:33–43.
14. Fitch WT, Giedd J. Morphology and development of the human vocal tract: a study using magnetic resonance imaging. *J Acoust Soc Am.* 1999;106(3 Pt 1):1511–1522.
15. Kohan EJ, Wirth GA. Anatomy of the neck. *Clin Plast Surg.* 2014;41:1–6.
16. Amir O, Levine-Yundof R. Listeners' attitude toward people with dysphonia. *J Voice.* 2013;27:524.e1–524.10.
17. Boersma P, Weenink D. Praat: Doing phonetics by computer [Compter program]. September 8, 2018. http://www.praat.org. Accessed October 24, 2018.
18. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *J R Stat Soc Ser B.* 1995;57:289–300.

APPENDIX

Acoustic Measures

Identifying gender differences in the acoustic properties of voice was not a primary research question in this study. Nonetheless, we wanted to confirm that recordings of the 2 genders were indeed different acoustically. Table A summarizes the results of the acoustic measures obtained for men and women, as well as the voice gender ratings (obtained from the listeners group). Data show that, as expected, female voices exhibited higher f0 values, as well as higher formant frequency values, than male voices. In accordance, female voices were rated as more feminine than male voices.

Table A. Means and SDs of the 4 Acoustic Measures and Gender Ratings of Men's and Women's Voices

Measure	Men (N = 15)	Women (N = 15)	*t*-value
Acoustic properties			
f0—sentence (Hz)	107.09 ± 15.22	197.10 ± 19.14	14.25*
f0—/a/ (Hz)	105.99 ± 16.50	194.08 ± 18.66	13.70*
F1—/a/ (Hz)	581.91 ± 40.93	717.99 ± 48.16	8.34*
F2—/a/ (Hz)	1,343.40 ± 78.51	1,626.27 ± 88.02	9.29*
Mean voice gender (femininity) rating	1.37 ± 0.20	5.18 ± 0.25	46.02*

All acoustic measures were significantly correlated with the subjective perception of gender ($0.87 < r < 0.95$, $P < .0001$).
* FBR-corrected $P < 0.05$