

**Critical Review:**  
**Is the Combination of Vocal Surgery and Therapy Effective for Voice Feminization in Male-to-Female Transgender Individuals?**

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This critical review compares outcomes of surgical and therapeutic voice feminization interventions in male-to-female transgender individuals to determine efficacy of adjunct non-surgical voice therapy. Study designs include retrospective/prospective studies and systematic reviews. Based on this review, researchers generally suggest that a combination of surgical and non-surgical interventions would be effective for voice feminization. However, voice feminization in transgender health has limited evidence on long-term quality-of-life effects. The area of voice feminization would require further research to determine best practice.

*Introduction*

In a transgender individual's transition journey from male to female, achieving a natural and feminine-sounding voice is one of the important steps of becoming a woman. A transgender individual's dissatisfaction with their voice has been found to prevent them from social participation and communication (Hancock, 2017).

Voice pitch contributes the most when perceiving a voice as either male or female (Pernet & Belin, 2012). Thus, pitch is typically the main aspect that many transgender individuals desire to change. According to the literature, the average speaking fundamental frequency for female voices can vary from 180 to 220 Hz and the average male fundamental frequency can vary from 100 to 140 Hz (Davies, Papp, & Antoni, 2015). While female-to-male (FtM) transgender individuals are usually able to achieve a deeper pitch using hormonal therapy, hormones are not able to increase pitch for male-to-female (MtF) transgender persons (McNeill, Wilson, Clark, & Deakin, 2008). Thus, many of these transgender individuals turn to surgical interventions to raise their pitch to attain voice feminization (Hancock, Colton, & Douglas, 2014). Voice feminization includes changes in  $F_0$  and resonance, which may be achieved by surgical means, although non-surgical interventions also exist (Davies & Goldberg, 2006).

Beyond pitch, the perception of either a male or female voice—gender identification through voice—can be influenced by other voice and speech characteristics, such as breathiness, intonation, articulation, word choice, and inflections (Coleman et al., 2012). Non-surgical voice therapy addressing these voice and speech characteristics can be delivered by speech-language pathologists and mostly focus on non-verbal

behaviours, intonation, and resonance (Davies & Goldberg, 2006).

As MtF people are one of the largest groups seeking voice therapy services (Davies, Papp, & Antoni, 2015), it raises the question of whether a combination of surgical and non-surgical interventions results in better acoustic and subjective outcomes in MtF patients than surgery alone. By evaluating the literature, clinicians can be better educated on transgender communication and health.

*Objectives*

The primary objective of this paper is to critically review the current literature in order to determine best practice in voice feminization of MtF transgender individuals.

*Methods*

Search Strategy

Online search engines, such as PubMed and Google Scholar, were used to find articles related to the topic of interest.

Keywords used for the title/abstract database search included:

("transgender" OR "MtF" OR "male-to-female" OR "transsexual") AND ("voice therapy" OR "vocal surgery" OR "voice surgery" OR "pitch elevation" OR "speech feminization" OR "voice feminization").

Selection Criteria

Included studies were required to focus on the efficacy of surgical and non-surgical interventions for the MtF individual. Case studies and reports were excluded from this critical review.

### Data Collection

A total of six papers were selected to be included in this critical review. Five papers (Anderson, 2014; Casado et al., 2017; Kim, 2017; Meister et al., 2017; Wagner et al., 2003) used a retrospective study design and one (Nolan et al., 2019) involved a systematic review of the literature.

## **Results**

### Retrospective Studies

Wagner et al.'s (2003) retrospective study looked at outcomes of 54 MtF individuals who received pitch-raising surgery and voice therapy. The chart review extracted information related to intervention course, acoustic measures pre- and post-surgery, voice ratings by speech-language pathologists, and satisfaction ratings by patients. Results revealed that 14 out of the 54 individuals chose surgery after feeling dissatisfied with voice therapy alone, and 12 out of the 14 received voice therapy after surgery. Follow-up occurred between one to 58 months after surgery with significant increases in fundamental frequency post-surgery. Speech therapists judged voices from poor to very good among the post-surgical patients, and patient ratings indicated that most patients were satisfied with intervention. It was found that speech therapist ratings were closely related to the changes in acoustic measurements, and patient satisfaction was related to neither of them.

Strengths of this study included appropriate statistical analysis of objective data while limitations included the small participant pool, retrospective design, and lack of direct comparisons between surgical and non-surgical interventions. Overall, this study provides equivocal evidence regarding whether adjunct voice therapy improves outcomes for MtF voice surgery patients.

Anderson's (2014) retrospective study examined outcomes for pitch elevation surgery (shortening of vocal folds) in 10 MtF transgender individuals who were dissatisfied with behavioural voice therapy. The chart review extracted information related to objective measures of fundamental frequency. The results in this study revealed significant pitch increases, but no changes in pitch range in the follow-up measures that occurred between six to 60 months post-surgery.

Strengths of this study included clearly defined and appropriate inclusion and exclusion criteria. However, the limitations included the retrospective nature of the study and the study containing only one outcome measure. Overall, this study provides suggestive evidence that behavioural therapy alone is not always satisfactory for MtF individuals, and that surgical

interventions can increase pitch but may not be able to alter the pitch range.

Casado et al. (2017) retrospective study appraised the effects of surgery in 8 MtF individuals and 10 MtF individuals who received surgery and therapy afterwards. The chart review included information on laryngoscopy, acoustic measurements, voice questionnaires by patients, and a perceptual voice evaluation for gender identification by blind listeners. The results revealed that there were significant differences between the two patient groups—patients who received both surgery and therapy had a higher change in fundamental frequency, reported more positive assessments of their progress and vocal quality, and were more likely to have their voices be rated as more feminine by listeners.

Strengths of this study consisted of the inclusion of examining the two patient groups, appropriate statistical analysis to compare data between groups, and the use of a standardized questionnaire for patients as well as a blinded listener evaluation as an outcome measurement. However, this study was also retrospective, which is a limitation as the researchers had less control in the study, such as the lack of control in the selection of patients into the two groups. Overall, this study had suggestive evidence that voice therapy is best used in combination with surgery for improved patient satisfaction and voice feminization for MtF individuals.

In Kim's (2017) retrospective review, the researcher analyzed acoustic and standardized perceptual assessments of 313 MtF individuals who underwent voice surgery and post-surgical therapy to achieve a feminine voice. The results found that fundamental frequency and self-ratings on quality-of-life had significant increased after intervention. The study also revealed that non-smoking individuals and younger age had a more positive impact on post-intervention outcomes.

The large number of participants was a strength in this study as it allowed the researcher to determine other factors that could affect intervention outcomes. Limitations of this retrospective study was that it did not have strict exclusion criteria for participants, making it difficult to control for individual variables. Additionally, this review failed to compare outcomes of surgery alone to outcomes from a combination of surgery and therapy. Overall, this study provided somewhat suggestive evidence that the combination of surgery and therapy can be helpful to increase fundamental frequency in MtF's voices.

Meister et al. (2017)'s retrospective study collected acoustic outcomes and standardized satisfaction and quality-of-life measures of 21 MtF patients following

surgery involving the shortening of their vocal folds. Some patients also reported to receive voice therapy sessions before surgery, after surgery, or at both times. The chart review results revealed that there was an insignificant difference in change of fundamental frequency range before and after surgery. Additionally, there was no correlation between fundamental frequency elevation and the number of voice therapy sessions received. However, the researchers did report that there was a strong correlation between patient's satisfaction with their voice and the patient's perceived femininity of their voice.

A strength in this study was that the researchers compared outcomes before and after surgery, as well as outcomes after voice therapy intervention. However, limitations consisted of the lack of control in the number and timing of voice therapy sessions, as well as the lack of other measures that could have been included to increase the study's evidence, such as a perceptual listening task by blind listeners. Overall, this study had suggestive support that a combination of surgery and therapy may not only lead to improved acoustic outcomes, but also more positive self-ratings on quality-of-life measures.

#### Systematic Review

Nolan et al. (2019) completed a systematic review of the efficacy of surgical and non-surgical interventions for MtF individuals. The search yielded 20 studies, which were rated by five reviewers and the evidence was rated as unsatisfactory as there was a large range in quality—the researchers indicated that half of the studies did not use appropriate statistical tests to assess significance, some did not use standardized tools, and many had missing outcome measurements.

Results revealed similar satisfaction ratings of 65 to 80% after voice surgery and therapy. Regardless of intervention, blind listeners rated MtF voices as more feminine after treatment, but there was a wide range of discrepancies in the literature. A wider range of fundamental frequency changes and larger pitch changes were observed using surgical interventions. The researchers concluded that patient satisfaction is the most important outcome in MtF transition treatment, and so the method of voice feminization will depend on a variety of factors, such as desired extent of pitch raising, cost, and medical risks. Overall, this study provides suggestive evidence that pitch changes may be more successful after surgical interventions.

#### *Discussion*

This critical review examined research describing outcomes related to surgical and non-surgical voice interventions for MtF individuals. Overall, there was

suggestive evidence that surgical interventions can result in increased fundamental frequency, and somewhat suggestive to suggestive evidence that quality-of-life and satisfaction in voice feminization can be improved with the addition of voice therapy. While surgery was acknowledged to aid in pitch elevation, many of the papers suggested that a feminine voice also required appropriate respiration, vibration, resonance, and articulation, which can be developed and maintained using techniques learned in voice therapy.

In this review, there were many limitations to the included studies, such as the retrospective nature, vague exclusion criteria, a negative selection bias, and the use of a variety of different outcome measurements across studies. The lack of control due to the retrospective design of the studies renders it difficult for researchers to have a defined exclusion or inclusion criteria, and to utilize the same standardized assessments within and between studies for consistency. Although many of the articles included acoustic outcomes of voice feminization interventions, it would also be beneficial to gather information on patient satisfaction and quality-of-life measures. It has been acknowledged by researchers that patient satisfaction from intervention is a strong correlation to their perceived femininity of their own voice (Meister et al., 2017; Nolan et al., 2019). Perceptual assessments from blind listeners would also be another useful measure to include in future studies as being able to be perceived to be a woman by their voice is the ultimate goal of MtF individuals. Furthermore, a negative selection bias may have potentially affected the analysis as patients who were more satisfied with their voice and did not want to revisit their transition experience may have been less willing to participate in this study.

#### *Conclusion*

While current research results are promising, a higher level of evidence and more information is necessary to more confidently interpret the data to determine whether a combination of surgery and therapy leads to better voice feminization outcomes than surgery alone. Although most surgical outcomes saw an increase in average fundamental frequency, fundamental frequency is not the only acoustic characteristic that can make a voice to be perceived as feminine. While surgery can increase average fundamental frequency, other voice traits, such as the pitch range, intonation, and voice quality, cannot all be improved from surgery alone. Instead, individuals may require voice therapy for maintenance and more positive long-term outcomes. Future studies should incorporate an increased level of control and conditions—such as a prospective research design, specific inclusion criteria, use of standardized

tests, and follow-up at equivalent time intervals—in order to study the long-term acoustic and quality-of-life outcomes of MtF voice feminization interventions to determine best practice.

### *Clinical Implications*

The limitations present in the studies in this critical review suggest that caution should be used when implementing these findings to clinical practice. In the meantime, it is helpful for speech-language pathologists to remember that patient satisfaction and their perception of themselves should remain an important outcome to measure in MtF transgender voice therapy.

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