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To cite this article: Tine Papeleu, Jennifer Oates, Joz Motmans, Dominique Morsomme, Guy T'Sjoen & Evelien D'haeseleer (20 Jun 2025): Voice-related challenges experienced by transgender and gender diverse individuals in Belgium, International Journal of Transgender Health, DOI: [10.1080/26895269.2025.2520958](https://doi.org/10.1080/26895269.2025.2520958)

To link to this article: <https://doi.org/10.1080/26895269.2025.2520958>



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Voice-related challenges experienced by transgender and gender diverse individuals in Belgium

Tine Papeleu^a , Jennifer Oates^b , Joz Motmans^c , Dominique Morsomme^d , Guy T'Sjoen^{c,e} 
and Evelien D'haeseleer^{a,f,g} 

^aCenter for Speech and Language Sciences (CESLAS), Department of Rehabilitation Sciences, Ghent University, Ghent, Belgium; ^bSchool of Allied Health, Human Services, and Sport, La Trobe University, Melbourne, Australia; ^cCenter for Sexology and Gender, Ghent University Hospital, Ghent, Belgium; ^dDepartment of Speech and Language Therapy, Research Unit for a life-Course Perspective on Health and Education (RUCHE), University of Liège, Liège, Belgium; ^eDepartment of Endocrinology, Ghent University Hospital, Ghent, Belgium; ^fDepartment of Otorhinolaryngology, Ghent University Hospital, Ghent, Belgium; ^gMusical Department, Royal Conservatory Brussels, Brussels, Belgium

ABSTRACT

Introduction: Transgender (trans) and gender diverse (TGD) individuals often face challenges related to voice and communication, prompting many to seek professional support. However, barriers to accessing voice and communication training (VCT) persist, and research on diverse needs of TGD individuals remains incomplete. Further, research on the voice and communication needs of TGD individuals across the broad spectrum of gender identities is also incomplete. This study investigates the voice-related needs, experiences with voice and communication services, and access barriers faced by TGD individuals in Belgium.

Methods: Using a community-based participatory approach, a questionnaire was co-developed with TGD individuals, assessing voice satisfaction, social impacts, and access to voice services.

Results: The questionnaire was completed by 197 TGD individuals with different gender identities, including feminine and transfeminine ($n=108$), masculine and transmasculine ($n=29$), non-binary presumed male at birth (PMAB) ($n=11$), non-binary presumed female at birth (PFAB) ($n=40$), and 'other or questioning' ($n=4$). Half of the participants (48.2%, 95/197) expressed dissatisfaction with their voices and felt their voices did not align with their gender expression. Misattributions and voice-related judgments negatively affected well-being and social lives. More than half (57.4%; 113/197) had engaged in VCT, reporting positive outcomes, particularly (trans)feminine individuals. All participants using masculinizing hormone therapy (21.8%; 43/197) experienced voice changes. Ten participants (0.05%; 10/197) underwent gender-affirming pitch changing surgery with mixed results. Non-binary participants, especially those PFAB, faced more barriers accessing VCT.

Conclusion: This study underscores the importance of voice in gender expression and well-being, offering new insights into voice-related needs of TGD individuals across gender identities. The study highlights the benefits of VCT and GAHT in reducing misattribution and increasing voice satisfaction, while identifying significant barriers to care in Belgium, especially for non-binary PFAB individuals. These findings fill a crucial gap, providing context-specific insights to improve gender-affirming voice services.

KEYWORDS

gender-affirming care; gender perception; non-binary experiences; transgender voice; voice and communication services

Introduction

Transgender (trans) and gender diverse (TGD) individuals may experience voice-related gender incongruence, when their voices do not align with their gender identity or desired presentation. According to Holmberg et al. (2023) and Jin et al. (2024), in TGD individuals, the voice is perceived as a significant gender marker, and for

some the most defining one. Voice and communication play a crucial role in gender satisfaction, accurate gender attribution, and overall well-being, and can significantly influence levels of psychosocial distress (Hancock, 2017).

According to the “biocultural assemblage view” described by Azul and Hancock (2020), the production of a speaker's gender is an ongoing, interactional process influenced by socio-cultural

CONTACT Tine Papeleu  tine.papeleu@ugent.be  Corneel Heymanslaan 10, 9000 Ghent, Belgium.

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/26895269.2025.2520958>.

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factors beyond the speaker's control. These include conversation partner practices (e.g. gender attributions), professional practices, and broader biocultural factors (e.g. vocal demands and societal expectations). Adopting this framework in clinical research improves understanding of communication-related stressors and supports tailored interventions (Adler et al., 2018; Azul, 2015; Hancock & Siegfriedt, 2019a).

Professional approaches to voice and communication modification for TGD individuals include changes brought about by gender-affirming hormone therapy, gender-affirming pitch changing surgery (further referred to as "voice surgery"), and/or behavioral adjustments supported by voice and communication specialists (VCSs) through voice and communication training (VCT) (Coleman et al., 2022). Azul and Hancock (2020) describe VCSs as experts who navigate the interplay between individual practices, professional interventions, and socio-cultural influences. They provide comprehensive assessments, guide goal-setting and intervention planning, and employ culturally responsive, person-centered strategies. Behavioral interventions may address various aspects, including respiration, pitch, resonance, loudness, projection, gestures, body posture, self-introduction, mindfulness, relaxation, assertive responses to misattributions, and practicing techniques in diverse contexts (Hancock & Siegfriedt, 2019b; Mills & Stoneham, 2017).

For TGD individuals presumed male at birth (PMAB) seeking a more feminine-sounding voice, gender-affirming hormone therapy does not impact vocal characteristics post-puberty due to irreversible changes caused by testosterone (Hancock & Garabedian, 2013). Consequently, they often pursue VCT and/or voice surgery to achieve a voice that feels authentic and comfortable (Coleman et al., 2022). This has led clinical voice research to focus largely on transfeminine individuals (Leyns et al., In press; Leyns et al., 2023; Leyns, Meerschman, et al., 2024; Leyns et al., 2021; Oates et al., 2023; Papeleu et al., 2025; Quinn et al., 2024; Rapoport et al., 2023; Södersten et al., In press).

Research with transmasculine individuals primarily examines the impact of gender-affirming hormone therapy with testosterone (i.e.

testosterone therapy) (Cosyns et al., 2014), as this can effectively deepen the voice. Consequently, this group is often undergoing or has undergone testosterone therapy, and tends to have a reduced need for voice and communication services such as VCT or voice surgery. However, some TGD individuals may require VCT due to insufficient testosterone therapy effects, voice difficulties caused by testosterone therapy, or a choice to not undergo hormonal intervention (Azul, 2016; Azul et al., 2018; Azul & Neuschaefer-Rube, 2019; Papeleu et al., In press). Several studies have already explored VCT for developing masculine-sounding voices (Buckley et al., 2020; Chadwick et al., In press; Dahl et al., 2022; dos Santos & Cielo, 2020; Mills et al., 2019; Myers & Bell, 2020). However, limitations in study quality make it challenging to draw clear conclusions about the effects of VCT. Methodological issues such as retrospective study designs, small participant groups, lack of control conditions, diverse study populations, insufficiently detailed descriptions of training protocols, and narrow voice assessment approaches contribute to these difficulties. As a result, these studies provide insufficient evidence to reliably determine the effectiveness of VCT for a more masculine-sounding voice. Consequently, existing clinical guidelines, often derived from research on transfeminine individuals, recommend training on features such as downward intonation patterns, reduced breathiness, and increased loudness for a more masculine-sounding voice (Schneider & Courey, 2016). Azul (2015) and Block (2017) emphasize the need for more targeted data on interventions designed to "masculinize" the voice.

Non-binary individuals are markedly underrepresented in voice research, which rarely addresses needs beyond the male-female binary (Davies et al., 2015), in line with their broader underrepresentation in trans research as a whole (Veale et al., 2022). Studies indicate that non-binary participants frequently seek gender-affirming voice care, expressing diverse voice training goals but often encountering misrepresentation and binary-driven assumptions in clinical settings (James et al., 2016; Lykens et al., 2018; Moog & Sund, 2021). These barriers hinder access to care (Kennedy & Thibeault, 2020; Shefcik & Tsai, 2021), underscoring the importance of client-centered

approaches that prioritize personal voice goals and experiences (Holmberg et al., 2023).

Building on this, qualitative studies by Holmberg et al. (2023) and Jin et al. (2024) highlighted common goals among TGD individuals, such as achieving an authentic voice, reducing misattributions, enhancing psychosocial well-being, and improving speaking comfort and social participation. In both studies, participants expressed mixed feelings about their decision to modify their vocal gender expression, a choice heavily shaped by sociocultural norms (Holmberg et al., 2023; Jin et al., 2024). The current literature reports on qualitative research, and although findings from such research is highly informative, quantitative research would likely add new knowledge. Furthermore, prior research has primarily focused on transfeminine and transmasculine individuals (Davies et al., 2015). Jin et al. (2024) stressed the importance of including all gender identities in gender-affirming voice care to better capture the diversity of voice-related experiences. Responding to this gap, the first aim of our study was to explore the voice-related wishes and needs of TGD individuals on a larger scale and across a wider spectrum of gender identities, broadening the scope of knowledge in this field.

Understanding the wishes and needs of TGD individuals for voice and communication services is crucial in ensuring that these services meet their unique requirements. Mapping out the experiences with voice and communication services can provide valuable insights into these needs, helping to inform and improve service delivery for the broader TGD community. In the current literature, several studies have explored the experiences of TGD individuals with voice and communication services (Harris et al., *In press*; Leyns et al., 2022; Mills et al., 2019; Papeleu et al., *In press*; Quinn et al., 2023). All of these studies have employed qualitative research methods, which is valuable as they capture the lived experiences of the participants. However, quantitative research can also contribute new insights by identifying broader patterns and statistical relationships that may not emerge from qualitative data alone. Specifically, it allows for a systematic investigation of the prevalence, intensity, and

impact of voice-related challenges among TGD individuals across larger and more diverse samples. In addition, previous studies have primarily focused on one specific subgroup of TGD individuals, such as transfeminine (Harris et al., *In press*; Leyns et al., 2022; Quinn et al., 2023) or transmasculine persons (Mills et al., 2019; Papeleu et al., *In press*), and on one aspect of voice and communication services, such as VCT (Harris et al., *In press*; Leyns et al., 2022; Mills et al., 2019; Quinn et al., 2023) or gender-affirming hormone therapy (Papeleu et al., *In press*). Therefore, the second aim of our study was to explore the experiences of TGD individuals who have received voice and communication services across the entire TGD population and for the different aspects of voice and communication services, including VCT, gender-affirming hormone therapy, and voice surgery.

Our third aim was to examine the barriers TGD individuals face in accessing voice and communication services, as these services are not always available in the manner or timeframe needed (Eyssel et al., 2017; Oğuz et al., 2021; Veale et al., 2019). Prior research, all conducted in the U.S., has highlighted numerous obstacles TGD individuals encounter when seeking (trans) healthcare (Lykens et al., 2018; Safer et al., 2016) and, more specifically, voice and communication services (Hancock & Downs, 2021; Kennedy & Thibeault, 2020; Moog & Sund, 2021). These include financial barriers (e.g. lack of insurance or income), discrimination, healthcare providers' lack of cultural competence, limited awareness of available services, inadequate or inappropriate information, and socioeconomic challenges such as transportation, housing, and mental health issues. Similar results were found in a few European studies, which furthermore highlighted that gender non-binary participants gave significantly worse evaluations of trans-specific healthcare services compared to transfeminine and transmasculine individuals (Burgwal & Motmans, 2020). Barriers to access are likely to evolve over time, and are influenced by different socio-demographic variables (such as age for example) and gender identities.

To summarize, our study has three aims: to investigate the voice and communication needs of TGD individuals as a diverse population

with varying challenges and preferences (1), their experiences of receiving voice and communication services (2), and the barriers they face in accessing VCT in Belgium (3).

Materials and methods

Our research project was completed according to the Declaration of Helsinki and ethical approval was obtained from the Ethics Committee of the Ghent University Hospital (registration number: B6702023000524). Informed consent was obtained from all individual participants included in the study through the completion of an informed consent form, in which they indicated their agreement to undergo the procedures outlined in the information sheet and their consent to participate in the study. The [supplemental materials](#) referenced in this publication are available *via* Zenodo: <https://doi.org/10.5281/zenodo.15599417>.

Study design

For the purpose of our study, a cross-sectional observational survey design was used. The TGD population was actively involved in various stages of our research, adhering to the principles of community-based participatory research (DeChants et al., 2020; Hwang et al., 2022). Together with our research team, they collaborated on the design and distribution of the questionnaire, contributed to the interpretation of the data, and participated in drafting and reviewing the manuscript. This approach emphasized mutual respect and equal partnership, ensuring our study was inclusive and reflective of the TGD community's perspectives.

Questionnaire

Development of the questionnaire

Several steps were taken to develop the questionnaire. Firstly, members of our research team (T.P. and E.D.) translated the study aims into eight topics, based on literature review and their clinical experiences developing and providing voice and communication services for TGD individuals. The topics are displayed and described in [Table 1](#). Subsequently, questionnaire items were

created by a group of six TGD individuals: two transfeminine, two transmasculine, one non-binary, agender individual, and one cross gender, gender fluid person with a mean age of 41 years (standard deviation: 15.1; range: 25-59 years). They were all undergoing gender-affirming hormone therapy and four of them were undertaking or had undertaken VCT. They first gave their individual inputs, which resulted in a large number of items. Consequently, two one-hour focus group sessions consisting of three of the TGD individuals were organized to discuss and select a reduced number of salient items. Although the focus group reduced the number of items to 103, this was still considered too many. Therefore, the individual input of the six individuals was again requested. Our research team considered their individual recommendations and made final decisions, resulting in 64 items.

Table 1. Description of the questionnaire topics and the number of items per topic.

Topics	Description	Items
1. Assessment of one's own voice (Dahl & Mahler, 2020; Young et al., 2021)	Satisfaction with voice, listening to one's own voice, congruence between voice and gender identity, and experiencing voice complaints.	<i>n</i> =6
2. Assessment of voice by other persons (Hancock et al., 2011)	Reactions from other persons to one's voice, impact of reactions on one's well-being, and discrimination.	<i>n</i> =6
3. Being addressed incorrectly by other persons (Catelan et al., 2021; Kennedy & Thibeault, 2020; Russell & Abrams, 2019)	Being addressed incorrectly (frequency, in which situations, feelings, and how to handle) and correctly (feelings).	<i>n</i> =6
4. Speaking comfort and influence of voice on well-being (Kennedy & Thibeault, 2020)	Feelings while speaking (anxiety and happiness; in which situations) and impact of voice on well-being.	<i>n</i> =7
5. Social life (Hancock et al., 2011)	Impact of voice on making contact with other people and participating in social life.	<i>n</i> =2
6. Voice adjustment(s)	Experiences with VCT, voice surgery, and gender-affirming hormone therapy; satisfaction and impact on voice.	<i>n</i> =26
7. Need for voice adjustment(s)	Need for VCT and voice surgery and personal goals.	<i>n</i> =4
8. Access to VCT (Azul, 2015; Russell & Abrams, 2019)	Barriers experienced when accessing VCT: availability of information, affordability, discrimination, misattributions, feeling unsafe, inappropriate language/terminology, insufficient knowledge and skills, and waiting lists.	<i>n</i> =10

Two researchers of our team (T.P. and E.D.) discussed and finalized the items before presenting them to the advisory board of Transgender Infopunt (i.e. the Flemish transgender information center) for feedback. The advisory board consists of TGD people who contribute to scientific research from their experiential expertise and perspectives. The advisory board was chaired by the coordinator of the Center for Sexology and Gender of the Ghent University Hospital (J.M.) and consisted of four TGD individuals

Table 2. Summary of feedback from advisory board and collaborating researchers.

Advisory board Transgender Infopunt	Collaborating researchers
Provide option to change the language throughout the questionnaire.	
When respondents prefer not to answer, provide an option to leave the question unanswered (to be announced at the beginning of the questionnaire).	
Gradual increase in question difficulty within a topic.	
Define specific terminology , e.g. intersex, well-being.	
Make questions specific , e.g. "How comfortable do you feel speaking with <u>people you know</u> (e.g. family, friends, colleagues, etc.)?"	
Include a time reference in questions, e.g. "How satisfied are you with your voice <u>at this moment</u> ?"	
Add questions:	Add questions:
1. Social gender affirmation	1. Information regarding voice training before and after voice surgery
2. Practicing exercises at home	2. misattributions by a VCS
	3. Inappropriate language/terminology by a VCS
Use the same type of scale for every question.	
Preference for Likert scales instead of visual analogue scales; in relation to neurodiverse individuals.	
Odd number of response options.	
Preference for objective measures , e.g. daily, weekly, ...	
Pilot questionnaire before disseminating it	Pilot questionnaire before disseminating it
Simplify the language	
	Language support for the translation of the questionnaire into French and English, e.g. face-to-face instead of physical.
	Replacing questions , e.g. information regarding gender-affirming hormone therapy not in sociodemographic questionnaire.
	Adding response options

(two transfeminine, one transmasculine, and one non-binary). In addition, two collaborating researchers (J.O.; La Trobe University and D.M.; University of Liège) speech-language therapists, with expertise in the field of VCT in TGD people, gave their input. The feedback of the advisory board and the collaborating researchers is summarized in [Table 2](#).

The first (T.P.) and last author (E.D.) reviewed all input from the advisory board and the collaborating researchers, finalizing the questionnaire with 67 items. These included single-answer multiple choice questions based on 5-point Likert scale (completely agree, agree, neither agree, nor disagree, disagree, or totally disagree; daily, weekly, monthly, several times a year, or almost never or never), multiple-answer multiple choice questions, yes-no questions, and open-ended questions. Adaptive questioning (i.e. certain items were only conditionally displayed based on responses to previous questions) was used to reduce the number and complexity of the questions. Consequently, there was a difference in the total number of questions completed by different participants.

Based on input from the advisory board and collaborating researchers, a pilot study with two TGD individuals was conducted to estimate the average time needed to complete the questionnaire, resulting in an average duration of 17 min. The questionnaire was initially developed in Dutch and later translated into French and English by the first author (T.P.). The collaborating researchers provided support in their native languages (D.M.: French; J.O.: English).

At the end of the questionnaire, general and demographic characteristics of the participants were requested, such as age (in years), sex assigned at birth (male, female, or other), and current gender identity. Participants were asked to describe their gender identity in an open-ended question 'How do you currently describe your gender identity?'. A wide variety of gender identities were mentioned, since participants were asked to self-describe their gender identity. Based on their answers, our research team classified the participants into five subgroups (see [supplemental material A](#)), with support from a member of the TGD community (J.M.). In addition, questions were

asked regarding their social gender affirmation, residence, home/main language, ethnicity, impairment(s) or disabilities, work situation and hobbies, and use of alcohol and other drugs.

Data collection

The final version of the questionnaire was transferred to the web based survey software Qualtrics^{XM} created by Silver Lake (Seattle, Washington USA). All items were presented in a fixed order and on one page per topic. In addition, the general and sociodemographic questions were presented on one page. Participants could change their answers during the survey using the “back” button and they could choose their language preference. The Dutch, English, and French presentation of the questionnaire can be found in [supplemental material B](#).

Participants were recruited through various channels. In the Flemish Region (i.e. the northern part of Belgium), participants were reached through the Transgender Infopunt website and social media. Additionally, the first author (T.P.) sent e-mails, flyers, and posters to the coordinators of the multidisciplinary gender teams ($n=6$), to speech language therapists working with TGD people ($n=63$), and to TGD community organizations ($n=28$) in the Flemish Region. The participant recruitment in the Walloon Region (i.e. the southern part of Belgium) was supported by the Walloon speech language therapist of our research team (D.M.). She distributed the questionnaire to several TGD community organizations ($n=6$), to speech language therapists ($n=3$) and a psychologist and sexologist ($n=1$) working with TGD people, to a multidisciplinary gender team, to the ‘Parole and Ecriture’ group (i.e. an organization offering writing workshops for TGD individuals and others interested in gender diversity), and researchers of the University of Liège working with the TGD community in The Walloon Region. For the recruitment of participants living in the Brussels-Capital Region, little to no network of contacts was available. For the Brussels-Capital Region (i.e. the central part of Belgium), one TGD community organization was contacted. Additionally, participants who completed the questionnaire were encouraged to share it with TGD individuals within their network.

Participation was anonymous and no incentives were offered to participate. The survey could be completed on a voluntary base by TGD people 18 years or older who had lived in Belgium for at least two years. Participants could access the questionnaire in Qualtrics^{XM} by clicking on a link or by scanning a QR code on flyers and posters. Data collection took place between December 2023 and May 2024.

Data analysis

Data cleaning

Before data-analysis started, different strategies for data cleaning were performed. Participants’ data were deleted if they did not complete the informed consent form or did not reach the end of the questionnaire. In addition, participants were excluded if they were not living in Belgium for a minimum of two years or were under the age of 18 years. The average amount of time to complete the questionnaire was 38 min (standard deviation: 107, range: 6-1169 min). Completed questionnaires were discarded if the total duration to complete the questionnaire was considered too short (i.e. duration of less than 6 min) to ensure data quality, as a very short response time indicates careless or random answers. This improves the reliability and validity of the results by minimizing response bias and lack of engagement. Moreover, responses were analyzed for patterns such as *Survey Straightlining* (i.e. consistently selecting the first response for every question, regardless of content) and *Christmas treeing* (i.e. choosing answers to form a visual pattern rather than responding meaningfully), and such cases were removed. Finally, data were cleaned for duplicates based on a combination of the same IP-address, age, and gender identity.

Statistical analysis

For statistical data analysis SPSS 29.0 (SPSS Corp., Chicago, IL, USA) was used with $\alpha = .05$. Firstly, an extensive descriptive analysis was performed. For the multiple-choice questions and closed-ended questions, percentages, averages, standard deviations, and ranges for numerical data (e.g. age) were calculated. The responses to the open-ended

questions were analyzed separately and categorized so that percentages could also be displayed.

Secondly, participant subgroup comparisons were performed for categorical and continuous data. To determine differences in categorical variables (binary and ordinal variables) between the five subgroups, the Chi-square test for independence or the Fisher-Freeman-Halton exact test (i.e. the extension of the Fisher's exact test to R-by-C tables) was used. To determine differences in continuous variables the One-way ANOVA test or Kruskal Wallis test was used. For post hoc analyses, significance levels were adjusted for multiple comparisons using the Bonferroni correction ($\alpha = .05/10 = .005$).

Thirdly, comparisons were performed between the three Regions in Belgium (Flemish Region, Walloon Region, and Brussels-Capital Region) for categorical data. Therefore, the Chi-square for independence or the Fisher-Freeman-Halton exact test was used and post hoc analyses with significance levels adjusted for multiple comparisons using the Bonferroni correction ($\alpha = .05/6 = .008$) were performed.

Lastly, comparisons were made between the group undergoing testosterone therapy and the group not undergoing testosterone therapy (only for participants PFAB) for categorical data. Therefore, the Chi-square or the Fisher's exact test was used, and post hoc analyses ($\alpha = .05$) were performed.

Participants

In total, 317 persons began the questionnaire, with 306 unique site visitors (determined based on unique IP addresses), a view rate of 99.7% (i.e. ratio of unique survey visitors/unique site visitors; 305/306), a participation rate of 99.7% (i.e. ratio of unique visitors who agreed to participate/unique first survey page visitors; 305/306), and a completion rate of 70.8% (i.e. ratio of participants who finished the survey/participants who agreed to participate; 216/305). During data cleaning, 120 participants were excluded due to not completing the informed consent form ($n=1$), not completing the whole questionnaire ($n=93$), not living in Belgium for at least 2 years ($n=18$), being younger than 18 years of age

($n=4$), responding too fast ($n=1$), and completing the questionnaire twice (i.e. duplicates) ($n=3$). Data-cleaning resulted in a total of 197 participants.

Participants' sociodemographic characteristics

The participant subgroups included: feminine and transfeminine (further referred to as "(trans)feminine") ($n=108$), masculine and transmasculine (further referred to as "(trans)masculine") ($n=29$), PMAB individuals with non-binary or other gender diverse identities including genderqueer, agender, polygender, genderfluid (further referred to as "non-binary PMAB") ($n=11$), PFAB individuals with non-binary or other gender diverse identities including genderqueer, agender, polygender, genderfluid (further referred to as "non-binary PFAB") ($n=40$), and "other or questioning" (i.e. all participants who could not be classified in any of the other four categories) ($n=4$). Five individuals did not describe their gender identity and consequently could not be classified (i.e. missing data). Participants' sociodemographic characteristics for the total group and across subgroups are presented in Table 3. Significant differences in age were found between the subgroups ($p<.001$); the group of (trans)feminine participants was significantly older than the groups of (trans)masculine individuals ($p=.004$) and non-binary PFAB individuals ($p=.047$).

Results

Descriptive statistics and subgroup comparisons

Assessment of one's own voice

Table 4 presents the descriptive data for "Assessment of one's own voice" for the total group and the statistical results for the subgroup comparisons. Table C1 (Supplemental Material C) shows the descriptive data for the total group and across subgroups. Significant differences were found between the subgroups for the degree to which an individual feels comfortable listening to their own voice. The group of (trans)masculine individuals felt significantly more comfortable to listen to the own voice than the groups of (trans)feminine ($p=.002$) and non-binary PMAB ($p=.002$) individuals.

Table 3. Participants' sociodemographic characteristics for the total group and across subgroups.

Items	Options	Total group	(Trans)feminine	(Trans) masculine	Non-binary PMAB	Non-binary PFAB	Other or questioning
Age in years	N	181	99	27	10	38	4
	Mean	32.5	36.2	27.2	29.5	28.8	25.0
	Standard deviation	12.12	13.47	9.05	5.48	8.56	9.42
	Min.-Max.	18-63	18-63	18-51	19-38	18-51	19-39
Sex assigned at birth (<i>n</i> = 197)	N	197	108	29	11	40	4
	Male	122(61.9%)	106(98.1%)	1(3.4%)	11(100.0%)	39(97.5%)	3(75.0%)
	Female	71(36.0%)	0(0.0%)	27(93.1%)	0(0.0%)	0(0.0%)	1(25.0%)
	Other	4(2.0%)	2(1.9%)	1(3.4%)	0(0.0%)	1(2.5%)	0(0.0%)
Are you currently living according to your perceived gender identity?	N	197	108	29	11	40	4
	Always	122(61.9%)	77(71.3%)	19(65.5%)	7(63.6%)	14(35.0%)	1(25.0%)
	Often	46(23.4%)	14(13.0%)	9(31.0%)	3(27.3%)	17(42.5%)	2(50.0%)
	Sometimes	27(13.7%)	16(14.8%)	1(3.4%)	1(9.1%)	8(20.0%)	1(25.0%)
Do you plan to do this in the future?	Never	2(1.0%)	1(0.9%)	0(0.0%)	0(0.0%)	1(2.5%)	0(0.0%)
	N	176	93	25	11	39	4
	Yes	175(99.4%)	92(98.9%)	25(100.0%)	11(100.0%)	39(100.0%)	4(100.0%)
When did your social gender affirmation start?	No	1(0.6%)	1(1.1%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	N	197	108	29	11	40	4
	No social gender affirmation (yet)	9(4.6%)	6(5.6%)	1(3.4%)	0(0.0%)	1(2.5%)	1(25.0%)
	Less than 3 months ago	2(1.0%)	1(0.9%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
Where in Belgium do you currently live?	3-12 months ago	21(10.7%)	13(12.0%)	1(3.4%)	2(18.2%)	4(10.0%)	1(25.0%)
	1-3 years ago	96(48.7%)	55(50.9%)	13(44.8%)	4(36.4%)	18(45.0%)	2(50.0%)
	3-10 years ago	61(31.0%)	28(25.9%)	12(41.4%)	5(45.5%)	16(40.0%)	0(0.0%)
	More than 10 years ago	8(4.1%)	5(4.6%)	2(6.9%)	0(0.0%)	2.5%	0(0.0%)
	N	196	107	29	11	40	4
Are you part of an ethnic-cultural minority? (<i>n</i> = 196)	The Flemish Region	146(74.5%)	75(70.1%)	22(75.9%)	6(54.5%)	36(90.0%)	4(100.0%)
	The Brussels-Capital Region	5(2.6%)	3(2.8%)	0(0.0%)	0(0.0%)	2(5.0%)	0(0.0%)
	The Walloon Region	45(22.9%)	29(27.1%)	7(24.1%)	5(45.5%)	2(5.0%)	0(0.0%)
Do you have an impairment or disability? (<i>n</i> = 196)	N	196	107	29	11	40	4
	Yes	11(5.6%)	6(5.6%)	1(3.4%)	0(0.0%)	3(7.5%)	1(25.0%)
	No	185(94.4%)	101(94.4%)	28(96.6%)	11(100.0%)	37(92.5%)	3(75.0%)
How do you describe your impairment or disability (multiple response options)	N	196	107	29	11	40	4
	Yes	93(47.4%)	37(34.6%)	16(55.2%)	8(72.7%)	28(70.0%)	3(75.0%)
	No	103(52.6%)	70(65.4%)	13(44.8%)	3(27.3%)	12(30.0%)	1(25.0%)
	Sensory impairment	8(4.1%)	5(4.6%)	1(3.4%)	0(0.0%)	2(5.0%)	0(0.0%)
Do you currently smoke? (multiple response options) (<i>n</i> = 197)	Learning disability	19(9.6%)	8(7.4%)	4(13.8%)	1(9.1%)	6(15.0%)	0(0.0%)
	Neurodivergent	70(35.0%)	23(20.4%)	11(37.9%)	8(72.7%)	25(62.5%)	3(75.0%)
	Mobility impairment	10(5.1%)	5(4.6%)	3(10.3%)	0(0.0%)	2(5.0%)	0(0.0%)
	Psychosocial disorder	63(31.5%)	21(19.4%)	11(37.9%)	5(45.5%)	23(57.5%)	1(25.0%)
Which substances are you currently using (in the period from 2 months ago to now)? (multiple response options)	Temporary disability due to illness or injury	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	Long-term medical illness	12(5.6%)	3(2.8%)	3(10.3%)	0(0.0%)	4(7.5%)	1(25.0%)
	Other	3(5.1%)	1(5.6%)	1(6.9%)	0(0.0%)	0(0.0%)	1(25.0%)
	Not applicable	64(32.5%)	47(43.5%)	7(24.1%)	2(18.2%)	5(12.5%)	0(0.0%)
Do you currently smoke? (multiple response options) (<i>n</i> = 197)	Tobacco	29(14.7%)	13(12.0%)	6(20.7%)	3(27.3%)	5(12.5%)	2(50.0%)
	Alcohol	80(40.6%)	43(39.8%)	16(55.2%)	4(36.4%)	13(32.5%)	4(100.0%)
	Drugs	17(8.6%)	6(5.6%)	3(10.3%)	2(18.2%)	4(10.0%)	2(50.0%)
	Other	18(9.1%)	9(8.3%)	3(10.3%)	2(18.2%)	4(10.0%)	0(0.0%)
If you smoke, how many years have you been smoking? (in years)	None of these substances	97(49.2%)	55(50.9%)	9(31.0%)	4(36.4%)	25(62.5%)	0(0.0%)
	Yes, cigarettes	21(10.2%)	9(7.4%)	4(13.8%)	2(18.2%)	5(12.5%)	1(25.0%)
	Yes, cigars	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	Yes, vaping	13(6.1%)	4(3.7%)	5(13.8%)	1(9.1%)	3(7.5%)	0(0.0%)
How many times a day do you smoke?	Yes, water pipe	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	Yes, pipe tobacco	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	Yes, other	8(5.6%)	3(4.6%)	1(6.9%)	2(18.2%)	2(5.0%)	0(0.0%)
	No	157(79.7%)	90(83.3%)	20(69.0%)	6(54.5%)	33(82.5%)	3(75.0%)
How many times a day do you smoke?	N	20	5	5	4	5	1
	Mean	10.8	16.6	8.4	14.5	6.2	1.00
	Standard deviation	11.85	8.65	12.14	20.62	3.56	—
	Min.-Max.	1-45	8-30	2-30	1-45	3-10	—
How many times a day do you smoke?	N	182	99	26	10	39	4
	Less than 5 times a day	14(7.7%)	5(5.1%)	3(11.5%)	2(20.0%)	3(7.7%)	1(25.0%)
	5 to 10 times a day	12(6.6%)	5(5.1%)	2(7.7%)	2(20.0%)	3(7.7%)	0(0.0%)
	More than 10 times a day	9(4.9%)	5(5.1%)	3(11.5%)	1(10.0%)	0(0.0%)	0(0.0%)
How many times a day do you smoke?	Not applicable	147(80.8%)	84(84.8%)	18(69.2%)	5(50.0%)	39(84.6%)	3(75.0%)

(Continued)

Table 3. Continued.

Items	Options	Total group	(Trans)feminine	(Trans) masculine	Non-binary PMAB	Non-binary PFAB	Other or questioning
What is your work situation right now?	I'm a student or pupil	56(28.9%)	19(18.5%)	13(44.8%)	3(27.3%)	17(42.5%)	2(50.0%)
	I am self-employed or a helper of a self-employed person	15(7.1%)	6(5.6%)	5(13.8%)	1(9.1%)	3(7.5%)	0(0.0%)
	I am an employee or civil servant	92(46.7%)	54(50.9%)	9(31.0%)	6(54.5%)	21(50.0%)	2(50.0%)
	I am a volunteer worker	12(6.1%)	6(5.6%)	2(6.9%)	0(0.0%)	3(7.5%)	0(0.0%)
	I am unemployed	20(11.2%)	15(14.8%)	0(0.0%)	1(9.1%)	2(7.5%)	0(0.0%)
	I am on (early) retirement	4(2.0%)	4(3.7%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)
	I am sick/disabled	24(12.2%)	15(13.9%)	4(10.3%)	2(18.2%)	3(10.0%)	0(0.0%)
	I am at home taking care of family members	1(0.5%)	0(0.0%)	0(0.0%)	0(0.0%)	1(2.5%)	0(0.0%)
Do you currently practice a profession that requires you to use your voice for several hours a day? (n = 195)	Other	3(7.1%)	3(4.6%)	3(10.3%)	1(9.1%)	5(12.5%)	0(0.0%)
	N	195	107	29	10	40	4
	Yes	61(31.3%)	34(31.8%)	9(31.0%)	1(9.1%)	15(37.5%)	2(50.0%)
Do you currently practice a hobby that requires you to use your voice for several hours a day? (n = 197)	No	134(68.7%)	73(68.2%)	20(69.0%)	9(81.8%)	25(62.5%)	2(50.0%)
	N	197	108	29	11	40	4
	Yes	36(18.3%)	22(20.4%)	2(6.9%)	1(9.1%)	7(17.5%)	1(25.0%)
	No	161(81.7%)	86(79.6%)	27(93.1%)	10(90.9%)	33(82.5%)	3(75.0%)

Table 4. Descriptive data for “assessment of one’s own voice” for the total group and statistical data for subgroup comparisons.

Items	Agree	Neither agree, nor disagree	Disagree	p-value
I am satisfied with my voice right now. (n = 197)	59(29.9%)	43(21.8%)	95(48.2%)	.188
I am comfortable listening to my own voice when I speak. (n = 197)	53(26.9%)	38(19.3%)	106(53.8%)	.003*
My voice sounds different in different situations. (n = 197)	150(76.1%)	19(9.6%)	28(14.2%)	.857
It is important to me that my voice matches my gender expression. (n = 197)	183(92.9%)	10(5.1%)	4(2.0%)	.241
I feel that my voice fits my gender expression at this time. (n = 197)	62(31.5%)	40(20.3%)	95(48.2%)	.139

*Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

Voice complaints mentioned by participants are shown for the total group and by subgroup in [Table C1 \(Supplemental Material C\)](#). The most

frequently reported voice complaints were hoarseness (15.7%; 31/197), vocal fatigue (12.7%; 25/197), and limited voice volume (8.6%; 17/197). Nobody from the “other or questioning” group mentioned voice complaints. Most participants reported experiencing voice complaints almost never or never (35.0%; 69/197). For those who did experience voice complaints, these typically occurred on a weekly basis (25.4%; 50/197).

In summary, the majority of participants indicated that it is important for their voices to align with their gender expression. However, most felt that their voices do not match their gender expression and reported dissatisfaction with their voices. Additionally, the majority experienced voice-related complaints, with the most commonly reported issues being hoarseness, vocal fatigue, and limited voice volume.

Assessment of voice by other persons

[Table 5](#) contains the descriptive data for “Assessment of voice by other persons” for the total group and the statistical results for the subgroup comparisons. [Table C2 \(Supplemental Material C\)](#) shows the descriptive data for the

total group and across subgroups. The group of (trans)feminine individuals cared more about how other persons they know judge their voices than the group of non-binary PFAB individuals ($p=.006$) and in the group “other or questioning”, other people’s evaluation of their voices affected how they felt significantly more than it did for individuals in the other groups ($p=.001$).

The majority of participants (125/196; 63.8%) received reactions from other people to their voices, mostly several times a year (37/125; 29.6%). From the 125 participants who received reactions to their voices, 41.6% (52/125) received predominantly positive reactions (e.g. “You have a nice voice!”, “Your new voice suits you better!”, or “Your voice has changed greatly!”), 19.2% (24/125) predominantly negative reactions (e.g. “Why does your voice sound higher than those of other men?”, “You’re an illegitimate trans individual because your voice does not match with your gender expression”, or “I don’t know how I have to identify you because of your voice”), and 39.2% (49/125) positive and negative reactions (e.g. “My surroundings hear no voice change, while persons I don’t know think my sounds noticeably feminine.”). Most participants (129/195; 62.2%) experienced voice-related discrimination almost never or never. Forms of discrimination include being addressed incorrectly ($n=14$), verbal aggression ($n=7$), being treated differently because of how their voices sound ($n=5$), refusal to address them correctly ($n=4$), mockery ($n=4$), being started at indiscreetly/finger pointing ($n=4$), laughing ($n=3$), humiliation ($n=3$), rejection ($n=3$), transphobia ($n=2$), and other forms

of discrimination (i.e. those cited by just one person).

In brief, the majority of participants reported that how others perceive and evaluate their voices affect how they feel, whether the feedback comes from people they know or from strangers. Participants described receiving positive reactions, negative reactions, or a combination of both. Most participants indicated that they rarely or never experienced discrimination related to their voices.

Being addressed incorrectly by other persons

The majority of participants (175/197; 88.8%) reported having been addressed incorrectly (i.e. misattribution) and most of them indicated that it happened on a daily basis (52/174; 29.9%). [Table C3 \(Supplemental Material C\)](#) shows the descriptive data for the total group and across subgroups. Significant differences in frequency of misattributions were found between the subgroups ($p=.009$). The group of non-binary PFAB individuals were addressed incorrectly significantly more than the group of (trans)masculine individuals ($p=.001$).

Misattributions occurred on the phone (140/175; 80.0%), in conversations during face-to-face encounters (114/175; 65.1%), when video calling (46/175; 26.3%), and in other situations (4/175; 2.3%). Participants mentioned that they felt sad (115/175; 65.7%), frustrated (107/175; 61.1%), bothered (86/175; 49.1%), anxious (39/175; 22.3%), angry (31/175; 17.7%), indifferent (17/175; 9.7%), and/or different (19/175; 10.9%) when they were addressed incorrectly. When participants were addressed correctly most of them felt happy (121/196; 61.7%), satisfied (121/196; 61.7%), comfortable (120/196; 61.2%), and/or euphoric (81.196; 41.3%). Some participants felt indifferent (8/196; 41.0%) and/or different (10/196; 5.1%) when being addressed correctly. Most participants (sometimes) correct (85/175; 48.6%) or do not respond (123/175; 70.3%) when they are addressed incorrectly by others. Twenty-nine percent of the participants (58/197) did not use strategies to avoid misattributions. The other participants introduced themselves (68/197; 38.9%), changed their voices (86/197; 49.1%), and/or used other strategies

Table 5. Descriptive data for “assessment of voice by other persons” for the total group and statistical data for subgroup comparisons.

Items	Agree	Neither agree, nor disagree	Disagree	p-value
I care how persons I know judge my voice. ($n=197$)	132(67.0%)	43(21.8%)	22(11.2%)	.007*
I care how persons I don’t know judge my voice. ($n=196$)	150(76.5%)	26(13.3%)	20(10.2%)	.308
Other people’s evaluation of my voice affects how I feel. ($n=195$)	150(76.9%)	30(15.4%)	15(7.7%)	.003*

*Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

(19/197; 10.9%) to avoid misattributions, such as highlighting their appearance ($n=10$) or avoiding talking ($n=4$).

To summarize, most participants reported being addressed incorrectly, with non-binary PFAB individuals experiencing this significantly more often. These experiences were commonly associated with negative emotions. To prevent misattributions, the majority of participants reported using various strategies, such as introducing themselves or adjusting their voices.

Speaking comfort and influence of voice on well-being

Table 6 demonstrates the descriptive data for “Speaking comfort and influence of voice on well-being” for the total group and the statistical results for the subgroup comparisons. Table C4 (Supplemental Material C) shows the descriptive data for the total group and across subgroups. No significant differences were found between the subgroups.

Sixty-nine percent of the participants felt less comfortable when talking loudly (136/197), 56.3% when talking on the phone (111/197), 50.3% during public speaking (99/197), 49.7% when singing (98/197), 49.2% when speaking to groups (97/197), 10.7% when whispering (21/197), and 6.6% in other situations (13/197) such as speaking to strangers ($n=4$). Four percent of the

participants (7/197) did not experience situations in which they felt less comfortable to speak.

Taken together, the majority of participants reported that their voices had an impact on how they felt, with several expressing feelings of anxiety when speaking. Many felt less comfortable using their voices in various situations, such as speaking loudly, talking on the phone, or speaking in public, as well as when interacting with people they did not know.

Social life

Half of the participants (98/196; 50.0%) experienced their voices as an obstacle interacting with other individuals. Table C5 (Supplemental Material C) shows the descriptive data for the total group and across subgroups. No significant differences were found in how often participants felt their voices interfered with their ability to connect with others across subgroups ($p=.607$).

The majority of participants (151/197; 76.6%) avoided activities because of their voices such as talking loudly (85/197; 43.1%), telephone conversations (84/197; 42.6%), singing (71/197; 36.0%), public speaking (70/197; 35.5%), speaking to groups (61/197; 31.0%), social activities in public (38/197; 19.3%), engaging in friendly and/or romantic relationships (38/197; 19.3%), applying for a job (24/197; 12.2%), engaging in hobbies (22/197; 11.2%), performing their job (18/197; 9.1%),

Table 6. Descriptive data for “speaking comfort and influence of voice on well-being” for the total group and statistical data for subgroup comparisons.

Items	Daily	Weekly	Monthly	Several times a year	Almost never or never	p-value
How often are you consciously concerned with how your voice sounds while speaking? ($n=197$)	110(55.8%)	48(24.4%)	23(11.7%)	7(3.6%)	9(4.6%)	.179
How often do you experience anxiety or discomfort while speaking? ($n=197$)	61(31.0%)	51(25.9%)	27(13.7%)	21(10.7%)	37(18.8%)	.110
How often do you experience joy or euphoria while speaking? ($n=197$)	21(10.7%)	43(21.8%)	28(14.2%)	19(9.6%)	86(43.7%)	.725
Items	Agree	Neither agree, nor disagree	Disagree	p-value		
I feel comfortable when speaking to persons I know. ($n=197$)	144(73.1%)	38(19.3%)	15(7.6%)	.611		
I feel comfortable when speaking to persons I don't know. ($n=197$)	58(29.4%)	53(26.9%)	86(43.7%)	.923		
My voice affects how I feel. ($n=197$)	168(85.3%)	20(10.2%)	9(4.6%)	.630		

Significance level $\alpha=0.05$ (Chi-square/Fisher-Freeman-Halton exact test)

going to school or receiving education (11/197; 5.6%), and/or participating other activities (5/197; 2.5%).

In brief, the majority of participants reported avoiding certain activities because of their voices, such as speaking loudly, talking on the phone, and singing. Additionally, half of the participants experienced their voices as a barrier to engaging in interactions with others.

Voice adjustments

More than half of the participants consciously modified their voices to achieve a different sound (123/197; 62.4%) and searched for information or did exercises themselves without the guidance of a VCS to adjust their voices (122/197; 61.9%). Table C6 (Supplemental Material C) demonstrates the descriptive data for ‘voice adjustments’ for the total group and across subgroups. Differences were observed between the subgroups ($p=.003$), with the group of (trans)feminine individuals adjusting their voices more than the group of non-binary PFAB individuals ($p=.006$). No significant differences were found between subgroups

regarding the actions they took to adjust their voices, such as searching for information or performing exercises without guidance ($p=.153$).

VCT. Table 7 shows descriptive data for “VCT” for the total group and the statistical results for the subgroups comparisons. The personal goals of participants who already attended VCT and the effects of VCT across subgroups are presented in Table C6 (Supplemental Material C). The group of (trans) feminine individuals was significantly more likely to have undertaken VCT than the (trans)masculine ($p<.001$) and non-binary PFAB individuals ($p<.001$) and the group of non-binary PMAB individuals was significantly more likely to have undertaken VCT than the (trans)masculine individuals ($p<.001$).

Thirty-three percent of the participants (37/111) mentioned that they were unable to do to most of the exercises at home for several reasons: they found it difficult without a VCS (25/37; 67.6%), there was no time (21/37; 56.8%), they had no motivation (21/37; 56.8%), there was no appropriate or safe place (16/37; 43.2%), they had no-one to help them (10/37; 27.0%), and/or other

Table 7. Descriptive data for “VCT” for the total group and statistical data for subgroup comparisons.

Items	Response options		Descriptives	p-value
Have you undertaken VCT to adjust your voice (n = 197)	Yes		113(57.4%)	<.001*
(Trans)feminine			88(81.5%)	
(Trans)masculine			2(6.9%)	
Non-binary PMAB			7(63.6%)	
Non-binary PFAB			13(32.5%)	
Other or questioning			1(25.0%)	
	No		84(42.6%)	
When did you undertake VCT to adjust your voice? (n = 112)	Currently		43(38.4%)	–
	1–6 months ago		18(16.1%)	
	6–12 months ago		20(17.9%)	
	1–3 years ago		25(22.3%)	
	3–10 years ago		4(3.6%)	
	More than 10 years ago		2(1.8%)	
For how long did you undertake VCT to adjust your voice? (n = 105)	0–3 months		18(17.1%)	–
	3–6 months		21(20.0%)	
	6–12 months		34(32.4%)	
	1–2 years		26(24.8%)	
	More than 2 years		6(5.7%)	
How many sessions of VCT did you undertake to adjust your voice? (n = 107)	0–5 sessions		16(15.0%)	–
	5–20 sessions		50(46.7%)	
	20–50 sessions		27(25.2%)	
	50–80 sessions		12(11.2%)	
	More than 80 sessions		2(1.9%)	
Items	Agree	Neither agree, nor disagree	Disagree	p-value
I am satisfied with the impact of VCT on my voice. (n = 111)	77(69.4%)	21(18.9%)	13(11.7%)	.615
I was able to do most of the exercises at home. (n = 111)	74(66.7%)	23(20.7%)	14(12.6%)	.295
I was able to apply the exercises while speaking in most situations. (n = 109)	53(48.6%)	27(24.8%)	29(26.6%)	.123

*Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

reasons. The majority of participants (82/113; 72.6%) reported specific situations where they could not apply the exercises, including at work (34/82; 41.2%), with family members (32/82; 39.0%) or friends (21/82; 25.6%), in public (28/82; 34.1%), during telephone conversations (25/82; 30.5%), and/or in other situations (3/82; 3.7%). No significant differences were found between the subgroups.

Voice surgery. Table 8 provides the descriptive data for “voice surgery” for the total group and the statistical results for the subgroups comparisons. Four percent of the participants (7/197) underwent a voice-raising operation by glottoplasty and 1.5% (3/197) combined glottoplasty with chondrolaryngoplasty (i.e. flattening of the Adam’s apple). All ten participants reported that the voice operation had an impact on their voices, with positive effects including higher voice pitch (6/10; 60.0%), less occasions where they were addressed incorrectly (6/10; 60.0%), positive reactions from other persons (3/10; 30.0%), greater speaking comfort (3/10; 30.0%), and side effects including more hoarseness (8/10; 80.0%), reduced loudness (6/10; 60.0%), more vocal fatigue (4/10; 40.0%), and less speaking comfort (3/10; 30.0%). The majority (90.0%; 9/10)

consulted a VCS either before or after their voice operation. Reasons for these consultations included undertaking VCT prior to (30.0%; 3/10) or after the operation (80.0%; 8/10), undergoing a voice assessment in preparation for the operation (60.0%; 6/10), and receiving information about the potential effects of the operation and post-operative voice care (30.0%; 3/10).

Gender-affirming hormone therapy. Table 9 provides descriptive data regarding “gender-affirming hormone therapy” for the total group and statistical results for subgroup comparisons. (Trans)feminine ($p<.001$) and (trans)masculine participants ($p=.002$) were undergoing gender-affirming hormone therapy significantly more than non-binary PFAB individuals. The groups of (trans)masculine and non-binary PFAB individuals were significantly more satisfied with the impact of gender-affirming hormone therapy on their voices than the groups of (trans) feminine ($p<.001$) and non-binary PMAB ($p<.001$) individuals.

More than half of the participants who were taking feminizing sex hormones (i.e. estrogens, antiandrogens, and/or progesterone) (63/105; 60.0%) experienced no influence of the hormones on their voices. The others experienced effects of the hormones such as positive reactions to their voices from other persons (23/105; 21.9%), increased ability to participate in social activities (16/105; 15.2%), more speaking anxiety (10/105; 9.5%), less speaking comfort (7/105; 6.7%), reduced speaking anxiety (6/105; 5.7%), more instances of being addressed incorrectly (5/105; 4.8%), negative reactions on their voices from other persons (5/105; 4.8%), increased vocal fatigue (5/105; 4.8%), reduced loudness (3/105; 2.9%), enhanced speaking comfort (3/105; 2.9%), a higher voice pitch (2/105; 1.9%), and/or other effects (3/105; 2.9%).

All participants taking masculinizing sex hormones (i.e. testosterone) reported experiencing various voice effects such as a lower voice pitch (38/43; 88.4%), positive reactions to their voices from other persons (27/43; 62.8%), fewer instances of being addressed incorrectly (27/43; 62.8%), more vocal fatigue (22/43; 51.2%), increased hoarseness (21/43; 48.8%), reduced speaking anxiety (20/43; 46.5%), decreased speaking comfort (16/43; 37.2%),

Table 8. Descriptive data for “voice surgery” for the total group and statistical data for subgroup comparisons.

<i>Items</i>	<i>Response options</i>		<i>Descriptives</i>	<i>p-value</i>
Have you undergone voice surgery to adjust your voice? (<i>n</i> = 197)	Yes		10(5.1%)	.182
	No		187(94.9%)	
If you saw a VCS before your voice operation, how many sessions did you attend? (<i>n</i> = 5)	1–2 sessions		0(0.0%)	–
	3–5 sessions		1(20.0%)	
	5–10 sessions		1(20.0%)	
	10–20 sessions		2(40.0%)	
	More than 20 sessions		1(20.0%)	
If you saw a VCS after your voice operation, how many sessions did you attend? (<i>n</i> = 9)	1–2 sessions		2(22.22%)	–
	3–5 sessions		1(11.1%)	
	5–10 sessions		5(55.6%)	
	10–20 sessions		1(11.1%)	
	More than 20 sessions		0(0.0%)	
<i>Items</i>	<i>Agree</i>	<i>Neither agree, nor disagree</i>	<i>Disagree</i>	<i>p-value</i>
I am satisfied with the impact of voice operation on my voice. (<i>n</i> = 10)	4(40.0%)	2(20.0%)	4(40.0%)	1.000

Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

Table 9. Descriptive data for “gender-affirming hormone therapy” for the total group and statistical data for subgroup comparisons.

		Descriptives		p-value
Items	Response options	N(%)	Mean duration (standard deviation); range in months	
Are you currently taking or have you taken hormones in the past? (n=196)	Yes Currently In the past No	152(77.2%) 150(98.7%) 107(70.4%) 44(22.8%)	-	<.001*
What type of hormones are you currently using? (n=150)	Feminizing sex hormones Estrogens Estrogens and antiandrogens Estrogens, antiandrogens, and progesterone Estrogens and progesterone Masculinizing sex hormones Testosterone	105(70.0%) 41(27.3%) 57(38.0%) 3(2.0%) 4(2.7%) 43(28.7%) 43(28.7%)	35(35.9); 1-240 48(33.9); 8-156 27(36.9); 1-240 28(12.1); 14-35 41(14.4); 24-57 24(19.9); 1-72 24(19.9); 1-72	
What type of hormones have you used in the past? (n=107)	Feminizing sex hormones Estrogens Antiandrogens Estrogens and antiandrogens Estrogens, antiandrogens, and progesterone Estrogens and progesterone Antiandrogens and progesterone Masculinizing sex hormones Testosterone	65(60.7%) 9(8.4%) 7(6.5%) 46(43.0%) 1(0.9%) 1(0.9%) 1(0.9%) 22(20.6%) 22(20.6%)	-	
Items	Agree	Neither agree, nor disagree	disagree	p-value
I'm satisfied with the impact of hormones on my voice (n=150)	46(30.6%)	53(35.3%)	51(34.1%)	<.001*

*Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

improved ability to participate in social activities (14/43; 32.6%), enhanced speaking comfort (12/43; 27.9%), increased loudness (9/43; 20.9%), flatter intonation (8/43; 18.6%), reduced loudness (6/43; 14.0%), more instances of being addressed incorrectly (4/43; 9.3%), increased speaking anxiety (4/43; 9.3%), reduced vocal fatigue (2/43; 4.7%), negative reactions from other persons (2/43; 4.7%), and/or decreased ability to participate in social activities (2/43; 4.7%). Two participants (i.e. one transmasculine individual and one non-binary PFAB person) had ceased testosterone therapy.

Five percent of the participants (5/105; 4.7%) had used puberty blockers in the past, one participant in combination with testosterone (1/107; 0.9%) and another in combination with estrogens and antiandrogens (1/107; 0.9%).

To summarize, over half of the participants reported consciously modifying their voices, with (trans)feminine individuals and non-binary PMAB participants significantly more likely to engage VCT. While most participants were able to practice voice exercises at home, many found it challenging to apply these techniques consistently in all contexts, such as at work, with

family, or in public. A small group of participants (n=10) underwent voice surgery to modify their voices, reporting both positive outcomes and side effects. The majority of these participants consulted with a VCS either before or after surgery. Participants primarily reported effects from masculinizing sex hormones on their voices, with (trans)masculine and non-binary PFAB individuals being significantly more satisfied with their voices than (trans)feminine and non-binary PMAB individuals.

Need for voice adjustment(s)

Table 10 shows descriptive data for “Need for voice adjustments” for the total group and statistical results for subgroup comparisons. Table C7 (Supplemental Material C) presents the descriptive data for the total group and across subgroups. The group of (trans)feminine individuals reported a significantly greater need to modify their voices ($p<.001$), a significantly stronger belief in the potential of VCT ($p<.001$), and a significantly higher demand to undergo voice surgery to adjust their voices ($p<.001$) than the group of (trans)masculine individuals.

Table 11 provides an overview of the personal goals for participants who wish to undertake VCT across subgroups. Most participants wanted to adjust their voices in all situations ($n=58$) or in everyday life ($n=13$). Others wished to adjust their voices in specific contexts such as at work ($n=8$), with people they do not know ($n=7$), on the phone ($n=7$), in public settings (e.g. in stores) ($n=6$), with family ($n=4$), while singing ($n=4$), in emotional situations ($n=3$), with people they know ($n=2$), with authoritarian people ($n=2$), and during hobbies ($n=2$).

Table 10. Descriptive data for “need for voice adjustments” for the total group and statistical data for subgroup comparisons.

Items	Agree	Neither agree, nor disagree	Disagree	p-value
I currently want to adjust my voice to match my gender identity or sound how I want. ($n=196$)	149(76.0%)	27(13.8%)	20(10.2%)	.002*
I think VCT helps/ might help to adjust my voice. ($n=193$)	150(77.7%)	27(14.0%)	16(8.3%)	.002*
I want to undergo voice operation to adjust my voice. ($n=196$)	28(14.3%)	32(16.3%)	136(69.4%)	<.001*

*Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

Taken together, (trans)feminine participants expressed a significantly greater need for voice modification, a stronger belief in the effectiveness of VCT, and a higher demand for voice surgery to adjust their voices. Overall, participants reported a need for a voice that aligned with their identity and contributed to their well-being. Frequently reported goals for VCT included modifying speaking fundamental frequency, resonance, and intonation.

Access to VCT

Table 12 presents descriptive data on “Access to VCT” for the total group and statistical data for subgroup comparisons. Table C8 (Supplemental Material C) provides descriptive data for the total group and across subgroups. The group of (trans)feminine individuals reported significantly greater ease in finding information about VCT compared to (trans)masculine individuals ($p=.001$) and were significantly more likely to consider VCT affordable than (trans)masculine ($p<.001$) and non-binary PFAB individuals ($p<.001$). Non-binary PFAB individuals faced significantly more barriers in finding a VCS compared to (trans)feminine individuals ($p<.001$).

Participants who experienced barriers to finding a VCS (106/196; 51.1%) reported financial

Table 11. Personal goals for VCT across the entire sample, categorized by subgroups.

Items	(Trans)feminine ($n=97$)	(Trans)masculine ($n=20$)	Non-binary PMAB ($n=10$)	Non-binary PFAB ($n=31$)	Other or questioning ($n=4$)
A voice that matches how they feel	76(78.4%)	12(60.0%)	6(60.0%)	15(48.4%)	3(75.0%)
Increase speaking comfort	60(62.5%)	11(55.0%)	5(50.0%)	15(48.4%)	2(50.0%)
Reduce speaking anxiety	45(46.9%)	7(35.0%)	3(30.0%)	7(22.6%)	1(25.0%)
Reduce being addressed incorrectly	62(64.6%)	8(40.0%)	6(60.0%)	17(54.8%)	2(50.0%)
Reduce negative reactions from other people	37(38.5%)	3(15.0%)	4(40.0%)	2(6.5%)	1(25.0%)
Increase well-being	65(67.7%)	11(55.0%)	6(60.0%)	20(64.5%)	3(75.0%)
Being able to participate more in social activities	31(32.3%)	3(15.0%)	2(20.0%)	3(9.7%)	2(50.0%)
A more feminine-sounding voice	85(88.5%)	0(0.0%)	8(80.0%)	0(0.0%)	2(50.0%)
A more masculine-sounding voice	0(0.0%)	14(70.0%)	0(0.0%)	16(51.6%)	1(25.0%)
Adjusting the pitch of the voice	51(53.1%)	6(30.0%)	4(40.0%)	21(67.7%)	2(50.0%)
Adjusting the loudness of the voice	28(29.2%)	4(20.0%)	2(20.0%)	7(22.6%)	1(25.0%)
Adjusting the timbre of the voice	50(52.1%)	8(40.0%)	3(30.0%)	16(51.6%)	2(50.0%)
Adjusting articulation	40(41.7%)	5(25.0%)	4(40.0%)	7(22.6%)	2(50.0%)
Adjusting intonation	47(49.0%)	7(35.0%)	3(30.0%)	14(45.2%)	3(75.0%)
Adjusting speaking rate	20(20.8%)	3(15.0%)	3(30.0%)	7(22.6%)	1(25.0%)
Adjusting body language	32(33.3%)	7(35.0%)	3(30.0%)	11(35.5%)	2(50.0%)
Adjusting my voice in reflex actions such as laughter, sneezing, coughing, and sighing	42(43.8%)	6(30.0%)	4(40.0%)	10(32.3%)	2(50.0%)
Other	1(1.0%)	0(0.0%)	0(0.0%)	1(3.2%)	0(0.0%)

barriers ($n=12$), finding it difficult to find an appropriate, competent VCS ($n=8$) or a trans friendly VCS ($n=3$), practical barriers (e.g. time ($n=5$), distance ($n=3$)), no energy ($n=2$), finding it difficult to find a VCS because they attributed it to their own personalities or anxieties (e.g. (social) anxiety ($n=9$) and fear of failure ($n=2$)), and/or no social support to start VCT ($n=2$).

In brief, half of the participants experienced barriers to finding a VCS, such as financial barriers, difficult to find an appropriate, competent VCS, and practical barriers. Non-binary PFAB individuals faced significantly more barriers in finding a VCS.

Comparisons between participants from different Regions in Belgium

Regional differences were observed in experiencing barriers to finding a VCS ($p=.012$). Participants living in the Walloon Region experienced significantly more barriers compared to those living in the Flemish Region ($p=.002$). No significant regional differences were found for other items.

Table 12. Descriptive data for “access to VCT” and statistical data across subgroups.

Items	Agree	Neither agree, nor disagree	Disagree	p-value
I can find information about VCT easily. ($n=196$)	128(65.3%)	47(24.0%)	21(10.7%)	<.001*
I think VCT is affordable for me. ($n=196$)	102(52.0%)	52(27.0%)	41(20.9%)	<.001*
I experience barriers to find a VCS. ($n=196$)	52(26.5%)	54(27.6%)	90(45.9%)	<.001*
I have experienced discrimination by a VCS. ($n=192$)	4(2.1%)	28(14.6%)	160(83.3%)	.046*
I have experienced insufficient knowledge or skills with a VCS. ($n=114$)	18(15.8%)	7(6.1%)	89(78.1%)	.517
I have experienced inappropriate language/terminology by a VCS. ($n=114$)	6(5.3%)	6(5.3%)	102(89.5%)	.392
I am being addressed incorrectly by a VCS. ($n=114$)	3(2.6%)	2(1.8%)	109(95.6%)	.913
I felt unsafe with a VCS. ($n=114$)	6(5.3%)	3(2.6%)	105(92.1%)	.206

*Significance level $\alpha=0.05$ (Fisher-Freeman-Halton exact test)

Comparisons between participants undergoing testosterone therapy and not undergoing testosterone therapy

Participants (PFAB) undergoing testosterone therapy reported significantly higher voice satisfaction ($p=.006$), comfort in hearing their own voice ($p=.002$), and alignment of their voices with their gender expression ($p=.026$ and $p=.002$) compared to those not on testosterone therapy. They were also more affected by others' evaluations of their voices ($p=.002$), less likely to be addressed incorrectly ($p=.003$), and experienced greater euphoria and joy while speaking ($p=.037$). Additionally, they felt more comfortable speaking with strangers ($p=.044$) and had a reduced need to modify their voices ($p=.014$). Participants not undergoing testosterone therapy found that obtaining information regarding VCT was easier than those on testosterone therapy ($p=.045$). No significant differences were found for the other items.

Discussion

Previous studies have highlighted a lack of research investigating the voice and communication-related needs of TGD individuals, as well as the barriers they face when accessing VCT (Holmberg et al., 2023; Kennedy & Thibeault, 2020; Moog & Sund, 2021). Therefore, our study aimed to identify the voice and communication-related needs of the diverse group of TGD individuals living in Belgium, as well as to explore their experiences with voice and communication services and the barriers they face when attempting to access VCT. There is a clear need for quantitative research to map these aspects, as it can provide a broader and more objective understanding of the experiences of TGD individuals.

Voice-related challenges

Approximately half of participants in our study were dissatisfied with their voices (48.2%) and uncomfortable hearing themselves speak (53.8%). Common voice complaints included hoarseness, vocal fatigue, limited volume, voice cracks, instability, and pitch concerns. Most participants (92.9%) in our study, similar to previous research (Holmberg et al., 2023; Jin et al., 2024; Moog &

Sund, 2021), valued their voices matching their gender expression. However, nearly half (48.2%) of participants felt that their voices did not align with their gender, which contrasts with the findings of Kennedy and Thibeault (2020), who reported a much higher rate of voice-gender incongruence (88.0%). This disparity may reflect differences in the proportion of participants who have undertaken VCT between our study (57.4%) and the study of Kennedy and Thibeault (2020) (15.0%).

In our study, most participants (63.8%) received voice-related feedback from others, with 41.6% receiving positive, 19.2% negative, and 39.2% both types of feedback. Participants valued others' opinions on their voices (67.0–76.5%), and 92.3% said this affected their emotions. Voice-related discrimination was reported by 66.2% and included misattributions, mockery, and transphobia. Misattributions (88.8%) occurred most in phone calls (80.0%) and in person (65.1%), evoking sadness (65.7%), frustration (61.1%), and anxiety (22.3%), while correct gendering brought happiness (61.7%) and reassurance (61.2%). To prevent misattributions, participants adjusted their voices (49.1%) or used alternative strategies such as introducing themselves or avoiding interactions.

Voice dissatisfaction, negative feedback, discrimination, and misattributions affected 80.2% of participants in our study, with 56.9% reporting frequent anxiety about speaking. Participants felt more comfortable speaking with acquaintances (73.1%) than strangers (39.4%), probably due to unpredictability of strangers' responses (Jin et al., 2024), and 85.3% reported that their voices affected their well-being. Similarly, participants in the study of Holmberg et al. (2023) noted that voice-related gender incongruence and the reactions of others on their voices primarily had a negative impact on their psychosocial well-being and gender dysphoria. Consistent with previous studies, participants in our study felt less comfortable in situations such as speaking loudly (69%), using the phone (56.3%), and public speaking (50.3%), leading to avoidance behaviors that impacted their social lives (Hancock, 2017; Jin et al., 2024; Leyns et al., 2022).

In contrast to the study of Jin et al. (2024), which observed shared experiences regardless of gender, our study identified differences in the voice-related experiences of participants with different gender identities. (Trans)masculine individuals, nearly all of whom were on testosterone therapy (96.0%), were more comfortable with their voices than (trans)feminine and non-binary PMAB participants, likely due to the direct masculinizing effects of testosterone therapy on the voice (Nygren et al., 2016). Similarly, non-binary PFAB participants in our study, 85.0% of whom were on testosterone therapy, required fewer conscious adjustments to their voices. Despite this, non-binary PFAB individuals experienced higher misattribution rates, which they attributed to the lack of gender neutral forms of address, leading to incorrect assumptions by others.

VCT

Over half of the participants in our study consciously altered their voices (62.4%) and practiced voice exercises without professional guidance (61.9%). A majority (57.4%) underwent VCT to modify their voices, higher than the percentages reported in previous studies: 15.0% (Kennedy & Thibeault, 2020), 12.5% (Moog & Sund, 2021), and 9.0% (Sawyer et al., 2014). This discrepancy may stem from the greater representation of (trans)feminine participants in our study, who pursued VCT more often than (trans)masculine or non-binary participants. In contrast, the direct vocal effects of testosterone therapy—used by 96.0% of (trans)masculine and 85.0% of non-binary PFAB individuals—likely reduce the need for VCT in these groups (Nygren et al., 2016). Additionally, some TGD individuals may have limited awareness of VCT for masculine voice modification. Recruitment bias may also have contributed, as some participants were recruited by VCSs while undergoing VCT.

Consistent with previous studies (Leyns et al., 2022; Quinn et al., 2023), most participants (90.3%) in our study reported positive outcomes from VCT, including positive reactions from others (38.9%), reduced misattributions (38.9%), decreased speaking anxiety (32.7%), and increased speaking comfort (31.0%). Satisfaction was high

(69.4%), though 26.6% struggled to apply techniques in daily life due to barriers to practice, such as lack of time (56.8%), motivation (56.8%), a safe or appropriate space (43.2%), and someone to help (27.0%), which aligns with prior findings (Holmberg et al., 2023; Leyns et al., 2022; Quinn et al., 2023). The majority (76.0%) sought voice adjustments, with common goals including an authentic voice (57.9%), increased well-being (54.3%), reduced misattributions (48.7%), and greater speaking comfort (47.2%), a finding consistent with prior research (Holmberg et al., 2023; Jin et al., 2024). In our study, 11.5% of (trans) feminine participants and a considerable proportion of non-binary individuals (20.0% PMAB; 48.4% PFAB) expressed no preference for a more gendered-sounding voice, aligning with findings of Kennedy and Thibeault (2020) on preferences for androgyny.

While most participants (65.3%) in our study found it easy to access VCT information—contrary to Kennedy and Thibeault's findings (2020)—ease of access varied by Region. In the Flemish Region, resources like Transgender Infopunt simplify access to gender-affirming care, due to its close relationship with the gender teams in the Flemish Region. In addition, in the Flemish Region, there is a strong collaboration between research teams, such as ours, and Transgender Infopunt, ensuring that both TGD individuals and professionals are well-informed based on evidence-based research. This strong connection allows for streamlined communication, better information dissemination, and more efficient referrals, ensuring that TGD individuals can navigate the healthcare system more easily and access the services they need. Consequently, only 21.1% of participants in our study questioned their VCS's competence, compared to 50.0% of participants in the study reported by Moog and Sund (2021). Lower discrimination and misattributions by VCSs compared to prior studies suggest that targeted support from specialized gender teams likely contributes to better access and outcomes. However, an organization as Transgender Infopunt is lacking in the other Belgian Regions, which might explain the found regional differences. This is also in line with previous Belgian studies where access to trans care

services was rated differently by participants per Region (Motmans et al., 2017). In addition, our study identified fewer barriers to accessing gender-affirming VCT than prior research, which highlighted discrimination and financial challenges (e.g. Kennedy & Thibeault, 2020; Moog & Sund, 2021). This may be explained by the difference in reimbursement, with Belgium offering reimbursement for VCS, unlike the U.S.

Voice surgery

In our study, 5.1% (10/197) underwent glottoplasty, with three of these participants also having chondrolaryngoplasty, despite 14.3% expressing interest in voice surgery. Demand was higher among (trans)feminine (19.6%) and non-binary PMAB individuals (18.2%), consistent with James et al. (2016) and Kelly et al. (2019), where 19.0–20.0% of transfeminine individuals sought voice surgery, often following dissatisfaction with VCT outcomes (Rogalska et al., 2024).

Participants who had glottoplasty reported increased pitch (60.0%) and reduced misattributions (60.0%) but experienced side effects including hoarseness (80.0%) and reduced loudness (60.0%). These side effects may result from the glottoplasty procedure, which intentionally induces fibrosis and scarring in the vocal folds—both well-known contributors to dysphonia. These structural changes can impair vocal fold vibration, increasing phonatory irregularity (perceived as hoarseness), and reducing subglottic pressure for loud phonation (Aires et al., 2023). The findings of our study align with previous literature on the effects of glottoplasty indicating an increase in fundamental frequency, increased masculinity/femininity ratings (i.e. gender perception), a decrease in intensity (decibel of sound pressure level, dB SPL), and a temporary decrease in voice quality and vocal capacities (Aires et al., 2023; Brown et al., 2021; Casado-Morente et al., 2024; Chang & Yung, 2021; D'haeseleer et al., In press; Titze et al., 2021). In contrast, the current literature reports more variable effects of chondrolaryngoplasty, including cases of temporary (Therattil et al., 2019) and chronic dysphonia (Nuyen et al., 2023). Temporary or chronic dysphonia following chondrolaryngoplasty can be

explained by the potential displacement of the laryngeal anterior commissure during the procedure. This displacement may occur due to an incorrect identification of the vocal fold level, leading to disruptions in the anatomical and functional structure of the larynx (Strickland et al., 2025). However, research on its effects remains limited, highlighting the need for further studies to systematically assess its impact.

Satisfaction with glottoplasty was mixed (40% satisfied, 40% dissatisfied), potentially due to side effects such as scarring and fibrosis of the vocal folds and/or anterior commissure affecting vocal function (Aires et al., 2023; D'haeseleer et al., In press; Song & Jiang, 2017; Titze et al., 2021). Most participants (90.0%) consulted a VCS, primarily for post-operative therapy (80.0%) and pre-operative assessments (60.0%), which is similar to participants in previous studies (Brown et al., 2021; Casado et al., 2017; D'haeseleer et al., In press; S. K. Rapoport et al., 2023).

In our study, no participants underwent voice-lowering surgery, though Ziegler et al. (2018) noted that 20.0% of TGD individuals undergoing testosterone therapy faced pitch-lowering difficulties post-gender-affirming hormone therapy, emphasizing the necessity of VCT and surgical alternatives (e.g. thyroplasty type III, bilateral injection laryngoplasty or repositioning the anterior commissure) for TGD individuals aiming for a more masculine-sounding voice.

Gender-affirming hormone therapy

The majority of participants (76.5%) in our study were currently undergoing gender-affirming hormone therapy, but non-binary PFAB individuals were less likely to be on gender-affirming hormone therapy. Three reasons why non-binary PFAB individuals were less likely to pursue gender-affirming hormone therapy were short-term testosterone use, concerns about voice and physical changes (e.g. beard growth), and fear of discriminatory healthcare. Among those on testosterone, most reported vocal changes, including a lower pitch (88.4%), increased vocal fatigue (51.2%), hoarseness (48.8%), and reduced loudness (14.0%). These side effects of testosterone therapy were expected, as previous studies have

reported them (Azul & Neuschaefer-Rube, 2019; Nygren et al., 2016; Papeleu et al., In press). They likely result from rapid laryngeal changes that the respiratory and resonatory systems cannot fully compensate for, reflecting the nonlinear nature of the phonatory system (Titze, 2000), where small structural changes can lead to disproportionate voice effects. In contrast, 60.0% of those on feminizing treatment reported no vocal changes. However, 40.0% reported experiencing vocal effects, an unexpected finding given the assumption that these hormones have no effect on the voice after puberty (Hancock & Garabedian, 2013; Quinn & Swain, 2018), since testosterone has already irreversibly virilized the voice (Bultynck et al., 2017). It is possible that participants' perceived improvements in voice were related to a broader sense of increased "femininity" due to physical changes, such as breast development (Bultynck et al., 2017).

In our study, (trans)masculine (96.0% under testosterone therapy) and non-binary PFAB individuals (85.0% under testosterone therapy) were more satisfied with the impact of gender-affirming hormone therapy on their voices, likely due to testosterone's direct effects. This aligns with previous studies, such as that of Kennedy and Thibeault (2020), but the current study found fewer voice-gender incongruence issues in those undergoing testosterone therapy (20.9%) compared to the findings of Kennedy and Thibeault (2020) (76.5%). This difference may be linked to the longer testosterone therapy duration in the present study (mean duration: 2 years), given that vocal changes stabilize after a year of testosterone therapy (Nygren et al., 2016). Unfortunately, Kennedy and Thibeault (2020) did not provide information on the duration of testosterone therapy, so this proposal cannot be confirmed.

Those on testosterone therapy were more satisfied with their voices, felt their voices more aligned with their gender expression, experienced more joy and euphoria while speaking, and experienced less misattributions. These outcomes were expected, as testosterone therapy directly affects the voice (Nygren et al., 2016). The frequency of misattributions was lower in those who had been on testosterone therapy for longer periods. However, 65.1% were still frequently addressed

incorrectly, and 48.8% reported the need for further voice adjustments (57.1% VCT and 2.3% voice surgery), particularly to address side effects such as hoarseness and insufficient pitch lowering. These results align with prior findings showing a general decrease in misattributions (Papeleu et al., *In press*) and improvements in overall well-being (Azul & Neuschaefer-Rube, 2019; Nygren et al., 2016) among TGD individuals undergoing testosterone therapy. However, in previous studies not all transmasculine individuals were consistently perceived as “male” after testosterone therapy (Azul, 2016; Azul et al., 2018; Nygren et al., 2016) and some expressed a need for professional voice support (Azul & Neuschaefer-Rube, 2019).

Strengths and limitations

A key strength of our study is that it is the first large-scale European investigation to comprehensively examine the voice-related experiences of a broader spectrum of gender identities, including non-binary PMAB and PFAB individuals. Participants were able to self-describe their gender identities, although this also meant that our research team had to classify identities based on these descriptions in order to streamline data analysis. Future researchers could improve on this method by combining self-description with predefined categories. Unlike prior studies using fewer gender categories (Kennedy & Thibeault, 2020; Moog & Sund, 2021), however, our study included five categories, distinguishing between non-binary PMAB and PFAB individuals and thus providing a more inclusive approach.

Another limitation of our study is that, due to the absence of comparable European studies, we were required to contextualize our findings primarily through studies conducted in the U.S. (Hancock & Downs, 2021; Kennedy & Thibeault, 2020; Lykens et al., 2018; Moog & Sund, 2021; Safer et al., 2016). This approach is not without its limitations, as the U.S. population is significantly more heterogeneous than the Belgian population, and the structure, accessibility, and cultural framing of voice and communication care for TGD individuals likely differ between the two countries. As a result, some voice-related

experiences in Belgium may not be directly comparable to those in the U.S. Moreover, while our findings provide important insights into the Belgian context, they cannot be readily generalized to all European countries due to differences in healthcare systems, cultural norms, and legal frameworks surrounding TGD care. Future research should therefore aim to build a broader, cross-national evidence base that reflects the diversity of experiences within Europe.

It should be acknowledged as a limitation that our study did not systematically explore the conditions or supports that facilitate access to gender-affirming voice care. While a range of barriers, including practical, emotional, and structural obstacles, was identified, less attention was given to what enables or supports individuals in obtaining these services. Facilitators such as community support, informed healthcare providers, or inclusive policies should be considered equally important, as they may inform best practices and guide targeted interventions. In future research, attention should therefore be given not only to the obstacles, but also to the conditions under which successful access to and engagement with gender-affirming voice care can be achieved.

Sample considerations

The sample size of our study ($n=197$) represents a larger proportion of the total TGD population in Belgium ($\approx 58,500$) (Cijfers over trans en genderdiverse personen in België, 2024) compared to similar studies conducted in the U.S. For instance, previous research by Kennedy and Thibeault (2020) in the U.S. with a sample size of $n=405$ was drawn from an estimated 1.6 million TGD individuals (Herman et al., 2022), making the relative representation in our study notably higher. This higher proportional representation enhances the generalizability of our findings within the Belgian context, as a larger fraction of the population is reflected in the sample. However, several limitations affect generalizability: our sample was weighted toward participants receiving gender-affirming services because recruitment methods involve medical providers (Ghent University Hospital) and support networks such as Transgender Infopunt. It is also possible that wording the announcement of the study as a

questionnaire for TGD individuals regarding voice reduced generalizability. This may have introduced bias in the findings, as individuals not engaged in voice and communication services might have different experiences or limited access to specialized support, training, or therapeutic resources.

Additionally, there was an uneven distribution of subgroups in our study, with significantly more participants in the (trans)feminine group compared to others. When comparing the sample of this study with the total number of TGD individuals enrolled in the Center for sexology and Gender of the Ghent University Hospital ($n=5091$), the sample appears representative for most groups, except for the (trans)masculine group, which was underrepresented (29/197; 14.7%) in our study (in the Center for Sexology and Gender at Ghent University Hospital approximately 51.9% of those enrolled have (trans)masculine identities; personal communication, September 11, 2024). Two possible explanations for the underrepresentation are a lack of awareness about available voice services for (trans)masculine people or satisfaction with their voices, likely due to the effects of testosterone therapy.

Moreover, in our study, there was an unequal distribution of participants from the three Belgian Regions (the Flemish Region, the Walloon Region, and the Brussels-Capital Region), with significantly more Flemish participants. This unequal distribution was also evident in previous Belgian studies (Motmans et al., 2015; Motmans et al., 2017). Recruitment in the Flemish Region was probably facilitated through collaboration with Transgender Infopunt, an organization with an extensive network of TGD individuals and strong connections with both the gender teams in the Flemish Region and our research team at Ghent University. Transgender Infopunt, as well as the other TGD organizations mentioned in the method section, significantly supported participant outreach and engagement. In contrast, according to our research partner in the Walloon Region (D.M.), such collaboration between organizations and research teams is still in its infancy in that Region. A similar situation is likely in the Brussels-Capital Region, which may have contributed to the more challenging recruitment process in these Regions. Future research should prioritize

recruitment in these other Regions to allow more rigorous investigation of regional similarities and differences between TGD individuals in Belgium.

The mean age of the participants in our study was 32.5 years, reflecting the younger demographic of the TGD community (James et al., 2016) and higher internet use among younger people (Räsänen, 2006; Ryan & Lewis, 2017) compared to the general population. (Trans)masculine and non-binary PFAB participants were younger than (trans)feminine individuals, aligning with the findings of previous studies (Government of Canada & Statistics Canada, 2022; Meyer et al., 2017; Motmans et al., 2017). In addition, only 5.6% of participants identified as part of an ethnic-cultural minority, compared to 35.5% in the general population of Belgium having foreign or non-Belgian backgrounds (Statbel, 2024). This may result from question phrasing, as some individuals may not perceive themselves as belonging to a minority group because of their ethnicity, or to recruitment challenges. Future studies should better target minority groups as their experiences are vital to understanding diversity within the TGD population (Burgwal & Motmans, 2020). Finally, Jin et al. (2024) suggested that voice-related experiences may change over time, with more negative impacts in the early stages of social gender affirmation and gradual improvement over time. In our study, most participants (83.8%) began their social gender affirmation over a year ago, potentially introducing bias. In addition, the age at which individuals start their social gender affirmation may influence these experiences. Future research should include more participants who are either early in their social gender affirmation or have not yet commenced it, so that the evolution of voice-related experiences in TGD individuals can be explored. Additionally, longitudinal studies could provide further insights into these developments over time.

Considerations related to the questionnaire

The questionnaire, developed in collaboration with six TGD individuals, adds value by integrating lived experiences, unlike studies that excluded TGD perspectives or incorporated them only in later research phases (e.g. Moog &

Sund, 2021; Kennedy & Thibeault, 2020). However, input from six individuals may not fully capture the diversity of experiences within the community. Future studies should aim for broader and more diverse participation in the development process. Additionally, some questions may unintentionally reinforce dominant societal norms or shift responsibility onto individuals rather than addressing structural issues. For example, some participants framed experiences such as “I am addressed incorrectly because of my voice” as a personal shortcoming, which risks reinforcing stereotypical and potentially harmful narratives. While these formulations emerged from community input, they do not necessarily represent the entire TGD population. This underscores an important consideration for future research: while community involvement is essential, it is equally crucial to critically assess question framing to ensure it does not unintentionally uphold societal expectations but instead challenges them where necessary.

A strength of the questionnaire was its use of response formats (Likert scales) chosen in response to recommendations of the TGD people consulted by our research team, despite their acknowledged drawbacks including limited sensitivity compared to Visual Analog Scales (Alkadi et al., 2022). Including both closed and open-ended questions also addressed criticism of prior studies (e.g. Moog & Sund, 2021) and allowed deeper insights. However, its quantitative focus may overlook nuanced subjective experiences, which qualitative or mixed-method approaches could address (Azul et al., 2018).

Using an online format can offer benefits such as anonymity and convenience; on the other hand it can also introduce challenges including lower response rates, survey fatigue, and limited opportunities for participants to seek clarification (Nayak & Narayan, 2019). Further, the questionnaire’s length (85 questions requiring an average of 39 min) exceeded recommendations for maintaining attention (Sharma, 2022). Reducing the number of questions to focus on key topics would likely enhance completion rates and data quality in future studies.

Clinical implications

These findings carry several clinical implications for professionals working with TGD individuals in voice and communication care. Given that voice is perceived by most participants as central to their gender expression and well-being, VCT could be regarded as a key component of gender-affirming care. The high uptake and positive outcomes of VCT in our study underscore its relevance as a gender-affirming intervention that can reduce misattributions, increase speaking comfort, and enhance psychosocial well-being.

In addition, the variability in voice-related experiences, including voice complaints, dissatisfaction, and the psychosocial impact of misattributions highlights the importance of individualized, client-centered approaches that go beyond technical vocal targets to address emotional and social dimensions. Clinicians should recognize the varied goals of TGD individuals, ranging from achieving an authentic voice to increasing emotional comfort. Understanding clients’ individual voice-related needs and goals can help VCSs design individualized training plans that target specific situations in which clients wish to adjust their voices. Therefore, questionnaires such as the Trans Woman Voice Questionnaire (Dacakis et al., 2013) and the Voice-related Experiences of Nonbinary Individuals (Shefcik & Tsai, 2021) could be helpful. The frequent voice-related avoidance of daily activities and the significant emotional impact of misattributions suggest that VCT may benefit from emotional counseling, including psychoeducational and coping strategies, especially for navigating challenging social contexts.

Furthermore, gender differences in voice satisfaction and voice-related needs underscore the necessity of accessible and competent voice care, particularly for (trans)feminine and PMAB non-binary individuals who cannot rely on hormonal effects for voice changes. Clinicians should be prepared to discuss potential treatment options, including voice surgery, alongside VCT. Furthermore, clinicians should consider integrating a holistic approach that combines VCT with guidance on voice surgery when appropriate, ensuring that clients are fully informed about all

available options for voice modification. While testosterone often yields satisfying outcomes for (trans)masculine individuals, non-binary PFAB participants in our study, despite similar hormonal changes, continued to experience high rates of misattribution—pointing to broader societal limitations such as the lack of gender-neutral language. Clinicians should be prepared to help clients cope with the structural limitations of gender expression in society. This includes offering support through the development of personalized coping strategies, such as dealing with misattributions or discriminatory responses, and equipping clients with concrete communication techniques like self-introductions or contextual cues. When desired, voice modification strategies can also be incorporated to reduce distress and enhance self-efficacy, as self-efficacy is a crucial factor in overcoming challenges and achieving training goals (Dacakis et al., 2024; Van Leer, 2021). In all cases, the focus should remain on affirming the individual's gender identity and supporting them in navigating environments that may not yet accommodate non-binary expressions. Taken together, these implications emphasize the need for an integrative model of voice care that is both technically skilled and psychologically affirming.

Barriers to practice, such as limited time, motivation, and lack of safe environments, suggest that voice professionals should offer flexible, accessible, and client-centered approaches that extend beyond traditional in-clinic sessions. Telepractice options, peer support, and asynchronous tools, such as prerecorded instructional videos, online modules, and feedback on self-submitted recordings, may increase practice adherence and transfer to daily life. In addition, VCSs and health care providers in general should be aware of the differences in access to VCT among different TGD subgroups. In our study, (trans)feminine individuals reported greater ease in finding information about VCT and perceived it as more affordable compared to (trans)masculine and non-binary PFAB individuals. This suggests a need for targeted outreach and support for (trans)masculine and non-binary PFAB individuals to improve access to VCT, ensuring affordability wherever possible, providing

emotional support, and fostering a welcoming and inclusive environment for individuals who may face anxiety or discrimination during the VCT process. Therefore, comprehensive training for VCSs is essential, emphasizing individualized care, culturally competent communication, appropriate language use, and addressing TGD-specific challenges (Pitts et al., 2009). Finally, regional differences in access and perceived competence of VCSs indicate the value of integrated care models and collaboration with trans-affirming networks, such as those available in the Flemish Region. These models can enhance both provider expertise and client trust, and should be expanded to other regions to address geographic disparities in access to VCT.

Conclusion

This study is the first large-scale European investigation to comprehensively examining the voice and communication needs of TGD individuals on a broad spectrum of gender identities including non-binary PMAB and PFAB individuals. The study revealed that voice plays a crucial role in gender expression, emotional well-being, and social participation, supporting previous research that highlights the centrality of voice in gender affirmation (Hancock, 2017; Holmberg et al., 2023; Jin et al., 2024). In addition, the results of this study provide more insight into the voice-related desires and needs of non-binary individuals, an area that has long been underexplored in both clinical practice and research (Davies et al., 2015). Second, this study explored TGD individuals experiences with voice and communication services, revealing both the value of VCT and gender-affirming hormone therapy in reducing misattributions and increasing voice satisfaction. Third, this study identified multiple barriers to accessing voice and communication services in Belgium, with non-binary PFAB individuals reporting the greatest difficulties. While similar barriers have been described in previous U.S.-based studies (e.g. Hancock & Downs, 2021; Kennedy & Thibeault, 2020), these findings cannot be directly generalized to the Belgian context due to differences in population heterogeneity and structural and societal conditions

surrounding TGD care. This study therefore fills a crucial gap by providing context-specific insights that can guide improvements in gender-affirming voice and communication services within the Belgian healthcare system.

Statement of human rights

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research ethics committee and have been performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Disclosure statement

No potential conflict of interest was reported by the author(s).

The writing process for this manuscript was enhanced with the use of Chat Generative Pre-trained Transformer, which provided linguistic support in refining the structure and language of the text.

Funding

The study was supported by Research Fund Flanders (grant number: 11A0323N/11A0325N).

ORCID

Tine Papeleu  <http://orcid.org/0000-0002-2949-0547>
 Jennifer Oates  <http://orcid.org/0000-0001-9340-938X>
 Joz Motmans  <http://orcid.org/0000-0001-7643-4153>
 Dominique Morsomme  <http://orcid.org/0000-0002-7697-0498>
 Guy T'Sjoen  <http://orcid.org/0000-0003-0457-9673>
 Evelien D'haeseleer  <http://orcid.org/0000-0002-3956-5936>

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