

From Misophonia through Puberphonia: Window Towards Gender Dysphoria in Autism?

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Abstract

Autism is characterized by distinct patterns of social communication, interests, and behaviors. *Gender incongruence* (GI) involves a mismatch between one's experienced and assigned gender, often accompanied by significant distress (i.e., *gender dysphoria*, GD). Recent studies revealed that autistic individuals (AT) report GD more frequently than the general population (Wattel et al., 2022) and are overrepresented in gender clinic settings. Autistic individuals also report hypersensitivity to certain sensory stimuli which can elicit distress. When this distress is triggered by certain auditory stimuli (e.g., one's or others' biological sounds such as chewing or swallowing) it is conceptualized as *misophonia*. While misophonia is not unique to autism and has not yet been conceptualized as a formal diagnosis, it appears to be highly prevalent in AT. We propose that a lesser studied phenomenon, *puberphonia*, could exemplify an attempt to reduce the distress elicited by misophonia in a certain category of individuals. Puberphonia is characterized by an unusually high-pitched voice, predominantly in teenage boys, and men, that can occur in the absence of identifiable physical causes. The psychogenic aspects of puberphonia are very little understood and we hereby propose several exploratory directions. On the one hand, we speculate that this may be an individual's attempt at diminishing a distressing reaction (misophonia) to their deepening voice, and that this may in turn be an indicator of unrecognized GD. Given that voice pitch has also been reported to be higher in autistic males compared to controls, we further propose that AT is likely prevalent among cases of psychogenic puberphonia. Finally, we wish to draw attention to the lack of epidemiological data regarding puberphonia and its potential link to GD, misophonia and AT.

Lay Summary

Misophonia, a condition defined by experiencing distress in the presence of certain auditory stimuli (e.g., chewing or swallowing) produced by oneself or others, is frequently reported by autistic individuals (AT). At the same time, there is a higher prevalence of AT reporting gender dysphoria (GD) compared to the general population. Gender dysphoria is formally defined as a mismatch between one's assigned gender and one's subjective experience. We hereby propose that those teenage boys and men who experience an unusually heightened pitch in their voice, a condition known as *puberphonia*, may attempt to address the distress (i.e., misophonia) triggered by their deepening voice. In many cases, puberphonia is *psychogenic* (i.e., no physiological or

medical causes can be identified). We hypothesize that in these cases, puberphonia may be associated with potentially unrecognized GD. We urge researchers to consider exploring the co-occurrence of GD and puberphonia and more broadly, their association with AT and misophonia.

Introduction

Autism Spectrum Disorder (AT) is currently conceptualized by the DSM-5 (American Psychiatric Association, 2013) as a neurodevelopmental condition, formally characterized by difficulties in social communication, restricted interests, and repetitive behaviors, this last category also including hypo- or hyper-sensitivity to sensory stimuli. These sensory sensitivities can elicit distress and further exacerbate social anxiety and social avoidance, already prevalent in AT (Montaser et al., 2023).

A distinct category of auditory stimuli that can trigger particularly strong negative emotions are bodily noises, such as chewing or swallowing, produced by oneself or others. Autistic individuals are among those who frequently report being sensitive to these stimuli (Rinaldi et al., 2023), which can further lead to social avoidance. This condition, named *misophonia*, has recently been formalized through expert consensus (Swedo et al., 2022).

A peculiar phenomenon, *puberphonia*, also called *mutational dysphonia* or *mutational falsetto*, reflects a failure in voice deepening in the absence of medical conditions, most frequently reported in boys going through puberty (Vuković & Čalasan, 2021). While puberphonia and misophonia are distinct conditions, they appear to share a common link to altered auditory perception and act as distressing emotional triggers.

Voice characteristics are tightly linked to gender identity. Both voice pitch and gender identity display distinct characteristics in AT. It has been shown that pitch is higher in AT men compared to neuronormative ones, but lower in AT women compared to neuronormative ones (Kissine et al., 2024). Gender identity is also much more fluid in AT compared to the general population (Kallitsounaki & Williams, 2023).

In this commentary, we attempt to draw a connection between these emerging patterns and argue that (1) psychogenic puberphonia warrants more comprehensive exploration, and (2) puberphonia may emerge as a key link between misophonia, gender incongruence (GI), and AT.

Autism and Gender Incongruence

Gender incongruence reflects situations when individuals' assigned and experienced genders do not align. *Gender dysphoria (GD)*, as defined by the DSM-5, involves a marked incongruence between one's experienced and assigned gender that is associated with significant emotional distress (Zucker et al., 2016). Recent studies have shown a higher prevalence of GD and non-binary gender identities among AT compared to the general population (Kahn et al., 2023; Sumia & Kaltiala, 2021), with AT being overrepresented in gender clinic settings (Shimoyama & Endo, 2024). This suggests that AT assessment and support services should be expanded to better cater to this profile.

Voice and Gender Identity

During puberty, the human voice undergoes a remarkable transformation, with distinct differences between males and females. This change is a hallmark of adolescent development and can be both exciting and challenging for young people. For boys, the voice change is typically dramatic and noticeable. As testosterone levels rise, the larynx grows significantly larger and thicker. The vocal folds, which were once short and thin, stretch and thicken, nearly doubling in length from about 8 mm to 16 mm. This substantial growth results in a voice that deepens by approximately one octave, a change that can occur rather abruptly (Harries et al., 1997).

This process usually begins around the age of 12 or 13 and may take several years to complete, often finalizing between the ages of 15 and 18. During this time, boys may experience a period where their voice becomes unpredictable, cracking or breaking unexpectedly. The voice may also take on a hoarse quality. These sudden shifts in pitch can occur at inconvenient times, such as in the middle of a sentence or during a public speaking event, leading to self-consciousness and anxiety. This process can therefore be accompanied by frustration and embarrassment.

Voice changes during puberty can have a significant impact on social relationships and interactions. Adolescents identifying as transgender were more than 4 times as likely to report voice problems compared with cisgender adolescents in a recent survey of vocal health (Fujiki & Thibeault, 2024). For boys, the dramatic deepening of their voice can be a source of both pride and embarrassment. As their voice breaks and cracks unpredictably, they may feel self-conscious speaking up in class or talking to peers, especially those of the opposite sex. At the same time, a deepening voice is often seen as a sign of maturity and masculinity, which can impact the boys' social and romantic relationships. In romantic relationships, voice changes can play a role in attraction and

confidence. A deeper voice in boys is often considered attractive, potentially boosting their confidence in romantic pursuits (Hodges-Simeon et al., 2010).

Puberphonia and Misophonia

It has been estimated that the prevalence of puberphonia in the general population is approximately 1 in 900,000 (Vaidya & Vyas, 2006). While a recent study (Fujiki & Thibeault, 2024) revealed that non-binary individuals reported a 4-fold higher prevalence of voice disorders compared to cis-gender individuals, the prevalence of puberphonia specifically in non-binary populations is unclear.

Puberphonia has a negative impact on males' social and romantic life (Besser et al., 2023) and psychotherapy or surgical intervention is usually sought to align the voice pitch to a person's perceived gender identity (Vuković & Čalasan, 2021). Given that many of these cases are psychogenic, surprisingly little research has been done to explore the psychological correlates of puberphonia. For example, given that voice changes are naturally occurring through puberty due to sex and thyroid hormonal changes (Afsah, 2024), one line of research that we argue warrants more attention would be to explore a potential link between puberphonia and GD. We believe that the first step would therefore be to explore the frequency of co-occurrence between these two conditions.

In psychogenic puberphonia, we argue that three patterns are likely to emerge. We speculate that puberphonia may be an attempt to address the misophonia triggered by one's deepening voice, potentially due to (1) autistic traits that predispose the person to experiencing misophonia, (2) unrecognized and unaddressed GD, or (3) both. Given the increased co-occurrence of AT, GD and misophonia, we propose that psychogenic puberphonia may emerge at the intersection of these three.

Diagnostic and Therapeutic Challenges

We argue that it is crucial to explore the likelihood that individuals with both GD and puberphonia are also struggling with misophonia related to their deepening voice. Given the extensive overlap between AT, GD and misophonia, how does puberphonia fit in this complex pattern? (Figure 1)

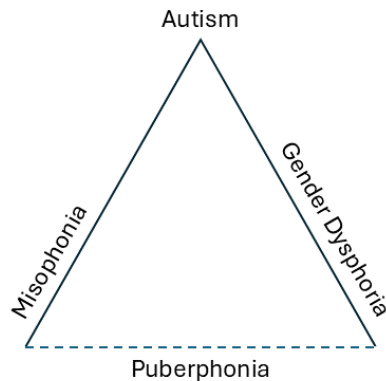


Figure 1. A proposed connection between puberphonia, as a possible way to cope with misophonia associated with pubertal voice deepening. We hypothesize that this might be a way to cope in individuals who experience GD. We further hypothesize that AT might be overrepresented as well in those who exhibit puberphonia, given the extensive overlap between AT, GD, and misophonia.

More epidemiological research is necessary to explore the co-occurrence of AT, GD and puberphonia, and the psychological correlates of puberphonia. Presently, we can merely speculate that puberphonia, misophonia and GD might be different facets of a complex phenomenon that could be overrepresented in AT, a group characterized by unusual voice pitch range and variability compared to controls (Asghari et al., 2021). We hope that this commentary serves as a call for action for the research community to fill in the knowledge gaps that we have hitherto highlighted.

We further argue that the phenotypic complexity of AT justifies the necessity for developing individualized approaches to diagnosis and subsequent support. To the extent that it is possible for the clinicians to explore additional facets of individual complexities (i.e., if clients and/or their caretakers are able to report on additional experiences), we argue that this should become the default approach to AT diagnosis. Other authors have previously argued that individuals seeking an AT diagnosis are better served by a neuro-affirmative approach that takes into account gender identity as well as other frequently associated conditions such as attention deficit hyperactivity disorder (ADHD), intellectual disability (ID), trauma, and more (Hartman et al., 2023). We argue that this assessment should also cover misophonia, given the high number of AT individuals who report such sensory processing challenges. Especially given that misophonia can have a negative impact on a person's quality of life and reinforce social anxiety and withdrawal, a broader scope for AT assessment would not only help explain the observed or reported behaviors, but also inform individualized support plans.

Gender identity has not traditionally been part of the diagnostic work-up for AT. The standard dimensions for AT diagnosis focus on social, emotional, language, communication, cognitive, movement, and physical development milestones, with little emphasis on gender-related aspects. This oversight can lead to missed cues for gender identity challenges in AT, resulting in unrecognized and unaddressed emotional. Additionally, conditions like puberphonia and misophonia may be overlooked, further complicating the diagnostic process.

The approach to treating puberphonia seems to prioritize medical interventions such as uvula manipulation, resonance therapy or thyroplasty (Kumaresan et al., 2022), which aim to align the vocal characteristics of the individual with that individual's reported gender identity, thereby reducing social stigma and psychological distress. These therapies focus on modifying the voice to better match the individual's self-perception and social expectations. These approaches do not always work, in which case patients are referred to a psychotherapist (Vaidya & Vyas, 2006). What is more, some authors note that some patients can manifest a “resistance to using their new chest voice”, in which case psychiatric help is sought in addition to the medical therapies (Dagli et al., 2008) We argue that a psychological evaluation of puberphonia patients should be the first step, and not an after-thought, before opting for more invasive approaches.

Conclusion

The intersection of AT, GD, puberphonia, and misophonia presents unique diagnostic challenges. Autistic individuals often experience heightened sensory sensitivities which can underlie some of the challenges they face in social interactions. These reactions could potentially contribute to the development or exacerbation of conditions like puberphonia and misophonia. Further investigation into the neurobiological underpinnings of these conditions in the context of AT could provide valuable insights into the etiology and potential treatment approaches (Yoram et al., 2010).

There is a consensus on the need for AT-specific accommodations in gender clinics (Cooper et al., 2023). These accommodations can help address the unique ways in which AT, GD, puberphonia, and misophonia may intersect and impact an individual's experiences and needs. In addition, they offer an optimal setting for researchers to explore the knowledge gaps regarding their co-occurrence.

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