

## THE ROLE OF BREATHY VOICE IN HMU TONE PERCEPTION

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### ABSTRACT

Previous studies on tone perception have mainly focused on the role of  $F_0$ , while there are few but increasing studies on the effect of non-modal phonation. This study investigates the role of non-modal phonation in perceiving the five level tones used in Hmu, in which the lowest level tone (T11) is often referred to as “breathy voice”. First, an acoustic analysis was conducted on those tones to determine the voice quality and whether breathiness is limited to specific tones, revealing that breathiness only co-occurs with T11. Second, a perception experiment was performed to investigate whether breathiness can influence T11 identification. Results show that identification scores significantly differ only for the pairs of two continua that involve T11. This suggests that, relative to other tones, native speakers rely on breathiness in T11 identification, which derives from the accompanying phonation in its production. These findings shed light on how, alongside  $F_0$ , non-modal phonation contributes to tone perception, which demonstrates a new kind for the role of phonation in tonal contrasts. Considering these results, it is thus necessary to incorporate phonation cues when defining tone.

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## KEYWORDS

Hmu Five level tones Breathy voice Tone perception

## 1. INTRODUCTION

Previous studies on tone perception have mainly focused on *F0* cues (e.g., Wang 1976; Abramson 1977; Gandour 1983; Kong 1995; Francis, Ciocca, and Ng 2003; Hallé, Chang, and Best 2004; Xu, Gandour, and Francis 2006; Peng et al. 2010); few have paid attention to the role of phonation cues in the perception of lexical tones in tonal languages where *F0* is ordinarily considered to be the primary dimension of phonological contrast (Yu and Lam 2014; Zhang and Kong 2014; Yang 2015; Huang 2020). In recent years, non-modal phonation has attracted much attention, which has been documented in various under-described languages. Some interesting findings have also been reported, such as the common phonation types across languages, the relationship between *F0* and phonation in tonal contrasts, the role of non-modal phonation in tone perception, and so on. These findings will be reviewed below, and then the purposes of this study will be outlined.

## 1.1 Two Types of Non-Modal Phonation-Tone Languages

Phonation usually can be divided into two categories: modal (default, baseline) and non-modal phonation. Among non-modal phonation types, breathy voice and creaky voice are most commonly used across languages (Gordon and Ladefoged 2001; Garellek 2019a; Esposito and Khan 2020). When these phonation cues in tonal languages are recognized, it is necessary to determine whether phonation cues could be a distinctive feature in tonal contrasts. Generally, there are two different kinds of non-modal phonation: pitch-independent non-modal phonation and pitch-dependent non-modal phonation (Kuang 2013). In the first case, languages make use of *F0* and phonation independently, such that tones with the same/similar *F0* and contour can be produced with different phonation types. In other words, when two lexical words have identical segments and *F0*, the only component that distinguishes one from the other is phonation, such as in the cases of Jalapa Mazatec (Silverman et al. 1995; Blankenship 2002; Garellek and Keating 2011), Mpi (Silverman 1997), Hani (Maddieson and Ladefoged 1985; Maddieson and Hess 1986;

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## 气嗓音对苗语声调感知的影响研究

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### 摘要

前人对声调感知的研究主要聚焦在 $F_0$ 的作用上, 鲜有研究关注特殊嗓音发声类型的影响。本文研究特殊嗓音发声类型在苗语五平调(低平调T11通常被认为具有气嗓音)感知中的作用。本项研究首先通过声学分析确定五个平调的嗓音质量, 以及气嗓特性是否仅限于特定声调, 结果显示气嗓特性仅与T11共现。在此基础上, 本文通过感知实验研究气嗓音是否会影响T11的辨认, 结果表明, 辨认得分仅在那些包含T11的声调连续统中存在显著性差异。这表明, 与其他平调相比, 母语者在T11的辨认中依赖其在言语产生中伴随而来的气嗓音。本文研究发现阐明了特殊嗓音发声类型如何与 $F_0$ 共同作用于声调感知, 这为发声类型在声调对立中的角色提供了一种新类型。综合上述结果, 从言语感知的视角看, 本文认为在定义声调时加入发声线索是十分必要的。

### 关键词

苗语 五平调 气嗓音 声调感知