

# Perceptual and Acoustic Analyses of Good Voice Quality in Male Radio Performers

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**Summary: Objectives.** Good voice quality is an asset to professional voice users, including radio performers. We examined whether (1) voices could be reliably categorized as good for the radio and (2) these categories could be predicted using acoustic measures.

**Participants and Methods.** Male radio performers ( $n = 24$ ) and age-matched male controls performed “The Rainbow Passage” as if presenting on the radio. Voice samples were rated using a three-stage paired-comparison paradigm by 51 naive listeners and perceptual categories were identified (Study 1), and then analyzed for fundamental frequency, long-term average spectrum, cepstral peak prominence, and pause or spoken-phrase duration (Study 2).

**Results.** Study 1: Good inter-judge reliability was found for perceptual judgments of the best 15 voices (good for radio category, 14/15 = radio performers), but agreement on the remaining 33 voices (unranked category) was poor. Study 2: Discriminant function analyses showed that the *SD* standard deviation of sounded portion duration, equivalent sound level, and smoothed cepstral peak prominence predicted membership of categories with moderate accuracy ( $R^2 = 0.328$ ).

**Conclusions.** Radio performers are heterogeneous for voice quality; good voice quality was judged reliably in only 14 out of 24 radio performers. Current acoustic analyses detected some of the relevant signal properties that were salient in these judgments. More refined perceptual analysis and the use of other perceptual methods might provide more information on the complex nature of judging good voices.

**Key Words:** voice–performance–supranormal–broadcaster–perceptual analysis.

## INTRODUCTION

Professionals in a large range of occupations—the media, entertainment, customer service, politics, education, and health—use their voices constantly to influence the choices of their subjects, clients, students, audiences, and consumers. Given the importance of voice to these professional voice users (PVUs),<sup>1</sup> it may be presumed that their occupational effectiveness is increased by the use of a “good” voice, that is, a voice that meets their individual needs in terms of stamina, power, intelligibility, and the ability to convey specific moods and attitudes or be perceived positively by listeners.<sup>2–4</sup> Good voice quality can also have personal advantages, such as greater vocal attractiveness,<sup>5,6</sup> credibility,<sup>7</sup> and a positive association with desirable personality attributes.<sup>8,9</sup> Good voice quality thus appears to have both occupational and personal advantages; it is likely to be a useful communicative attribute for PVUs in many aspects of their lives.

Despite this, little is known about listener judgments of good voice quality and what objectively constitutes a good voice for many PVU groups. This is because normal and supranormal (ie, good or better-than-normal) voices have no common or validated descriptors in the literature. Good or supranormal speaking voices have been evaluated using many descriptors, such as

“projected,”<sup>10</sup> “sonority,” “variable in loudness,” and “ringing voice quality,”<sup>11,12</sup> as well as “continuity” and “emphasis.”<sup>13</sup> In addition, definitions and listener judgments of good voice quality may vary in different situations and occupations, presumably because of differing voice requirements. For example, various demands are placed on actors’ voice quality, projection, range, stamina, and variability depending on the role or production.<sup>10,14–16</sup>

One group of PVUs who heavily rely on a good voice quality are radio performers (including broadcasters, newsreaders, and voiceover artists). Radio performers are unique in that they utilize only verbal communication when interacting with their audiences and competing in the radio marketplace. As such, the judgments of good voice quality in this population are less likely to be affected by nonverbal features, such as proxemics, body language, and physical appearance. The subjective features of good voices on the radio have been considered in literature spanning the last 80 years. Radio employers are likely to employ performers who sound easy to listen to, warm, natural, and animated, yet still speak with a “depth of pitch” and vocal clarity.<sup>17</sup> Many radio teaching materials have also identified vocal characteristics that contribute to good voice quality<sup>18</sup> in radio performers. These include “pleasant voice,”<sup>19</sup> “well-defined articulation/diction,”<sup>19,20</sup> conversational delivery style,<sup>21</sup> and good use of “timing” and “pause.”<sup>21</sup> Given that some of these features may not be present in the voices of vocally healthy controls,<sup>13,22</sup> most radio performers may be considered as supranormal (better-than-normal) voice users.<sup>11</sup>

Although radio employers and educators usually control the occupational parameters for radio performers, radio listeners are the performers’ intended audience and have assumed significance in the performers’ continuing employment. Radio performers may manipulate their communication style to appeal to the target audience’s age, gender, level of education,

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socioeconomic status, and interests. In other words, voices on radio are inherently heterogeneous as they will suit the station for which the performers are working or the product they are advertising.<sup>17,22,23</sup> Unlike dysphonic voice quality, for which psychometrically sound rating tools have been developed,<sup>24–26</sup> good voice quality as used by radio performers (and other PVUs) is poorly understood. It is possible that good voice quality for radio may have various definitions depending on listener expectations, listening context, the material being presented, and the radio performer's speaking role (eg, announcing vs newsreading).<sup>17</sup> This suggests that judgments of good voice quality might be susceptible to poor inter-rater reliability, as heterogeneous listeners would use different features when evaluating the quality of a voice.<sup>26–28</sup> However, recent research also suggests that listeners can use perceptual cues to accurately and reliably identify voiceover artists from normal controls.<sup>22</sup> It may be hypothesized, therefore, that listeners can mutually identify or agree on at least some features of radio performers' voices and that there is some homogeneity in voice quality for this population.

Research on radio performers' voices is limited. However, their acoustic and perceptual characteristics have both been compared with controls with no performance experience.<sup>3,13,22</sup> Professional voiceover artists were accurately differentiated from controls by naive listeners,<sup>22</sup> and listeners with speech pathology backgrounds perceived professional newsreaders to have better voice quality, style of newsreading, continuity, phrasing, and emphasis than controls.<sup>13</sup> These perceptual differences were also reflected in some acoustic measures, such as greater standard deviation of fundamental frequency,<sup>13</sup> greater pause time distribution,<sup>22</sup> and greater low-frequency spectral gain.<sup>3</sup> Despite these group differences between professional broadcasters and controls, research to date has been limited by the use of speech pathology students or voice trainers as listeners (eg, Refs.<sup>13,29</sup>), definitions of voice quality that include disordered features (eg, Ref.<sup>13</sup>), and perceptual constructs that lacked experimental validation (eg, "firmness" in Ref.<sup>29</sup>).

This paper presents two sequential studies of radio performers' voices (Study 1 and Study 2). Given the limitations of previous research and the probable salience of good voice quality for radio performers and other PVUs, Study 1 investigated whether naive listeners could rate voices based on how good they are for radio with acceptable inter-rater reliability. Study 1 also sought to form perceptual categories based on these results. Although good voice quality in performers has been investigated in a number of previous studies (eg, Refs.<sup>11,30</sup>), the present study differed from these as it made no attempt to predefine good voice quality for radio. A method of paired-comparisons approach was used,<sup>31</sup> which meant that listeners made preferences based on their internal standards, but always in reference to another stimulus. This method avoided potential limitations of previous approaches, as it did not rely on researcher-defined or externally defined perceptual constructs or definitions, which might not be relevant to naive listener judgments or be ecologically valid. Moreover, naive listeners and experienced listeners differ in the perceptual attributes they use to judge voice quality,<sup>32</sup> so consistent listener judgment of researcher-defined attributes is inherently problematic. Other considerations when designing this

study were that, on average, listeners listen to talk radio for 1–3 hours at a time,<sup>33</sup> and listeners have a diverse range of listening preferences depending on their age, gender, socioeconomic status, and level of education.<sup>17,33</sup> Therefore, to ensure an ecologically valid representation, a large range of listeners was included and the perceptual task was designed so that listeners rated voices for an hour or less (ie, equal to or less than average radio listening times).

The aim of Study 2 was to determine whether any acoustic measures could accurately predict the listeners' ratings of voice quality (ie, any perceptual categories created in Study 1). The listener judgments made in Study 1 were complex and unlikely to be *strongly* predicted by acoustic measures. However, the measures could possibly provide information about the objective cues used by listeners (the radio performers' target audience) in judging whether a voice was good for radio or not. They might also provide clues about specific perceptual features that may be salient to listeners' judgments. The acoustic measures of fundamental frequency, the long-term average spectrum, the cepstral peak prominence (CPP), and the pause or spoken phrase duration were chosen as they had previously been used in studies of vocal performers or had high validity in measuring the dysphonic voice.<sup>13,22,34</sup> Furthermore, based on suggestive evidence,<sup>10,34,35</sup> these measures reflect the perceptual constructs of pitch, vocal quality, and temporal variability, to varying degrees. The research question and rationale for Study 2 are discussed in more detail following the results of Study 1.

## STUDY 1

Ethical approval was obtained from The University of Sydney Human Research Ethics Committee (13089).

### Methods

#### *Radio performer and normal control participants*

Radio performers were recruited using an e-mail advertisement distributed through Commercial Radio Australia, The Australian Broadcasting Corporation, and numerous commercial radio networks, voiceover casting agencies, and radio advertising companies. Radio performers needed to meet the following criteria to be included: age 18–52 years; employment as radio broadcaster, announcer, newsreader, or voiceover artist within the radio industry in the preceding year; self-identified as having an Australian accent; and no history of voice disorder within the preceding year. The initial age criterion of 18–50 was extended to 52 years as a number of successful radio performers fell in this extended age range, resulting in a larger, more representative sample. Information was collected on the role the radio participants most commonly performed on radio, ie, voiceover artist, newsreader or news broadcaster, or announcer or broadcaster. Eight radio performers self-identified as primarily voiceover artists, five as newsreaders or broadcasters, and eleven as announcer or talk broadcasters.

Control participants were recruited using an e-mail advertisement distributed through The University of Sydney's student and staff bulletins and sent directly to The University of Sydney speech pathology students. Control participants were included in the study if they were native speakers of English, identified

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