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Conclusions

Our results support the main hypothesis that diminished autonomic response is associated with emotional blunting. They also point to a major role played by the parasympathetic branch of the ANS. More specifically, patients with low parasympathetic tone feel lower intensity of anger and sadness, and display blunting of vocally expressed emotional arousal. The sympathetic branch of the ANS played a role only in the spectral differentiation of emotional valence (anger vs. joy).

To the extent that an individual's autonomic tone is inherent to his or her personality, one could expect autonomic lesions to impact some of the prominent personality traits. In a recent study, Schweiger and colleges found that individuals with high vagal tone are less inhibited and do not try to deny feelings (Schweiger, Witling, Genzel, & Block, 1998). It thus appears that our finding relating a disease induced change in the vagal tone to the awareness of change in emotionality, may have psychological consequences for the patients' personality. The assumption is based on the fact that emotion experiences provide continuity in the functioning of personality. Emotional feeling states that remain constant over time link the stability of emotion experience to personality (Barrett & Campos, 1987; Izard, Libero, Putnam, & Haynes, 1993). Caroll Izard and colleagues have convincingly demonstrated how emotions become linked to particular thoughts to form affective-cognitive structures, which in turn combine into cognition-emotion-action patterns that characterize the individual's style of adaptive behavior and contribute to the development of personality.

We can thus expect subjects with impaired cardiovascular reactions to have altered emotional experiences with subsequent consequences for the regulation of the organism's interaction with physical and social environment. Indeed, vocal signaling of emotional states serves an important function of regulating social interactions. It not only provides information about the speaker's attitudes and behavioral tendencies, but it is also informative about the speaker's acceptance of social and cultural demands and expectations (Gregory, Webster, & Huang, 1993; Rosenfeld, 1987). Altered vocal signaling of emotions may therefore impact the person's social functioning.

To conclude, we believe that damage to the nerves in the cardiovascular system not only affects the autonomic responsivity, its flexibility, and its balance, but it also induces a CNS-ANS dysregulation (Friedman & Thayer, 1998) resulting in a dysregulation of the organism's adaptive biological and social response to environmental challenges.

Acknowledgments. I extend special thanks to Professor Krzysztof Izdebski for his constructive remarks in the elaboration of the manuscript, to Dr. Yves Morel for his administration of the autonomic function tests, and to Véronique Ullmann for her work on qualitative assessment of the patients' verbal comments.

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Autism, Social Perception, and the Superior Temporal Sulcus

Autism is a severe, pervasive developmental disorder characterized by deficits in three domains: (a) social interaction, (b) communication skills, and (c) restricted interests and repetitive, stereotyped behaviors [DSM-IV; American Psychiatric Association (APA), 1994]. There is a wide range of variation in abilities within these domains; however, all three types of deficits are present to some degree in individuals with autism. Additionally, there is a large range of intellectual capacities: although many of these individuals exhibit mental retardation, others have average or even superior abilities.

Social impairment is the primary, unique feature of autism (Kanner, 1943; Wing & Gould, 1979). Early problems in social perception, such as joint attention, are indicators of autism (Baron-Cohen, 1995; Dawson et al., 2002; Lord et al., 1997; Sigman et al., 1999). Also, these children fail to recognize biological motion in point-light displays, where lights are placed on the joints of people in a dark room and can be seen as they move around (Blake, Turner, Smoski, Pozdol, & Stone, 2003; Klin, Jones, Schultz, & Volkmar, 2003). Additionally, individuals with autism have a hard time identifying the emotions portrayed by faces in photographs, particularly fear and anger (Adolphs, Sears, & Piven, 2001; Pelphrey et al., 2002).

In order to explore emotional recognition deficits in individuals with autism, we quantified visual attention to faces (Pelphrey et al., 2002). In an eye-tracking study of adults looking at photographs of faces, we found that the adults with autism spent more time looking at the nonfeature portions of the face (e.g., forehead, cheeks) than did typical adults. Additionally, there was a corresponding decrease in the visual examination of core features (i.e., the eyes, nose, and mouth) by the individuals with autism relative to the individuals without autism. This suggested disorganized face processing and could be related to their overarching social perception problems. Similar results were reported in another study of scanpaths over faces by individuals with autism by Klin and colleagues (2002).

An impaired understanding of the implications of gaze direction is also characteristic of autism. Baron-Cohen (1995) showed pictures of a cartoon face named Charlie looking at one of four types of candy to children with typical development, mental retardation, or autism. When asked, "What is Charlie's favorite candy?" the typically developing children and those with mental retardation correctly responded with the name of the candy at which Charlie was looking. However, the children with autism failed to do this. However, when shown a different set of pictures with faces looking towards or away from them, all of the children could correctly answer the question, "Which one is looking at you?" Together, these results suggest that children with autism can perceive gaze direction, but they do not link it with its social and mental significance.

These deficits, combined with our prior findings on gaze perception in the superior temporal sulcus region, suggested that dysfunction in this area could relate to autism (Pelphrey, Morris, & McCarthy, 2005). In order to test this hypothesis, we used fMRI and our congruent versus

Introduction

The area of affective speech research has received much attention over the last years. Nevertheless, the effects of individual and cultural differences on affective speech production are still largely neglected. Most cross-linguistic studies concern the perception of vocal emotions (Scherer, Banse, & Wallbott, 2001). They show that humans can recognize vocal emotions with an accuracy percentage well above chance, even in unknown languages, though the level of accuracy is higher in native and close to native languages. The research suggests that vocal realization of emotions is based both on universal mechanisms and cultural conventions. A large number of acoustic parameters were identified as possible means to express emotions in speech: pitch range, intonational patterns, voice quality, rhythm, and so on. At the same time, the usage of these means, their level of importance, and their meaning vary across languages (Abelin & Allwood, 2000; Chen, 2005).

Studies of cross-linguistic production are still quite rare (Boula de Mareuil, Célérier, & Toen, 2002). They usually involve a very small number of speakers per language and disregard a widely observed phenomenon in affective speech —a high interspeaker and intraspeaker variability. Individual speakers have a large number of possible acoustic means to express emotions and a high flexibility of choice and manner of usage that can be considered appropriate in their language and speech community. The existing research is primarily concerned with adults, and studies of child affective speech are very rare and mostly based on perception only (Clément, 1999; Van der Meulen, Janssen, & Den Os, 1997).

The main objective of this research is to investigate the production of affective speech by bilingual (raised in two languages from birth) and monolingual children cross-linguistically in Scottish English and French. Socio-emotional competence is essential for effective communication, and it is one of the priorities in child development. Bilinguals communicate their emotions in two different languages, and they have to use acoustic means related to affective speech appropriately.

Being raised in two different languages and cultures, bilinguals may be competent to express affective states in their two languages. So, our first hypothesis is that bilingual affective productions may fall in the acceptable range in each of their languages. On the other hand, bilinguals produce two languages that differ in some acoustic correlates for affective states. Bilinguals may have a wider range of means and ways to express emotions, and their affective realization may not strictly correspond to those of monolinguals in each of their two languages. This phenomenon has been attested to in bilingual studies of other phonetic aspects (Aoyama, Flege, Guion, Akahane-Yamada, & Yamada, 2004; Mennen, 2004). Thus, our second hypothesis is that bilinguals may represent a particular group of speakers who express vocal emotions in a different manner than monolinguals.

Methodology

The starting point for this study was to develop an appropriate methodology to record child affective speech. Though spontaneous speech is claimed to contain the most authentic emotions, its collection gives rise to numerous difficulties: speakers should be recorded without

how, or perhaps better stated where, speech occurs in the respiratory cycle does arise. In fact, clinical experience has shown that users of an EL, regardless of whether it be a neck-type or intraoral device, often suspend respiration altogether at points of speech output. This strategy is at times used to discourage the speaker from having respiratory noise compete with the EL signal. This same problem of "stoma noise" has been reported to be a real and significant impediment to successful acquisition of esophageal speech in that stoma noise or stoma blast secondary to excessive expiratory force may mask the less intense esophageal speech signal (Doyle, 1994).

In summary, three methods of postlaryngectomy speech rehabilitation exist, each with inherent advantages and disadvantages. Because of the disconnection between the primary airway and the structures comprising the vocal tract, secondary limitations specific to the respiratory system do emerge. The consequences of this disruption clearly have an effect on respiratory patterns, which may in turn create limitations in the conveyance of emotion following total laryngectomy. The essence of this disruption is seen primarily in alterations in the synchrony with which respiration and sound production may be achieved. However, the larger issue relative to the expression of emotional states in the present context is that the respiratory system is no longer linked to sound generating structures. When coupled with alterations in respiratory phase, the combined influence of these factors on emotional expression are substantial. Further information concerning associated problems that arise is presented in the subsequent section.

Problems Conveying Emotion: Postlaryngectomy Limitations and Restrictions

Evolving from our knowledge of the normal and postlaryngectomy speech production system, and regardless of alaryngeal mode, let's now consider two common acts of emotional expression as they might exist on a continuum, laughing and crying. Although both can be done volitionally and sometimes without true, internalized, and spontaneous emotional involvement (e.g., consider the polished actor), they more regularly exist as involuntary acts of emotional expression in response to a particular event or stimulus.

Laughing in Those Who Are Laryngectomized

The more pleasant of these two emotions, laughing, requires considerable integration of several physical structures.[8] The respiratory system in coordination with the abdomen and thoracic wall contribute greatly to the act of laughing. This involves active participation of a number of muscles in order to control movements associated with laughing. In the normal system, respiratory airflow is modulated through the upper airway and larynx, prior to moving into the vocal tract. In contrast, however, in those

[8]From a physiologic perspective, laughing and crying may share many common characteristics relative to airway and respiratory control mechanisms.

who are laryngectomized, while muscular movements associated with the act of laughing do occur, the product of this movement terminates through an open and unrestricted tracheostoma. For this reason, one might view the act of laughing in the individual who is laryngectomized as a paroxysmal respiratory event without vocalization of any form. More simply stated, laughing for those who are laryngectomized is tantamount to going through the respiratory motions without the benefit of acoustic speech output observed in the normal system. A common clinical complaint regarding this deficit is reported to be the lack of simple satisfaction of completing the act of laughing as it would have occurred normally.

Clearly, laughing may be characterized by variance relative to the intensity of the response and we have all observed the continuum from a subdued, light chuckle to the almost infectious belly-laugh. The duration of the response may be brief or extended, dependent upon the circumstances and how receptive and/or appropriate the behavior is for a given environment.

For the laryngectomized person, laughing is in essence manifest as solely a responsive change in breathing dynamics —short, quick inspiratory and expiratory movements secondary to adjustments in the abdominal and thoracic walls. Similarly, the disconnection from the ability to generate sound in response to respiratory actions is what creates the greatest level of loss for these individuals based on direct report from those who are laryngectomized. Consider laughing without the ability to make any type of vocalized noise and one can see that the conveyance of what might be viewed as a simple but primary human emotion is disrupted substantially. What this suggests to us in the case of laughing is that the ultimate satisfaction from this behavior is found in the direct linkage to and ultimate representation in some type of vocalization.[9] Shanks (1994) has recommended that attempts at compensating for the loss of normal laughter via use of a "body shake and thigh slapping," in addition to potential facilitation of this loss of emotional expression though "stoma exhalation concomitant with esophageal phonation" (p. 215) are of value. However, my own clinical interactions with those who are laryngectomized suggest that such levels of compensation are not satisfactory. This observation lends further credence to the suggestion that the loss of this ability to convey a common behavioral activity that is directly related to an affective state is reduced considerably if not entirely eliminated in the clinical population. Those who are laryngectomized frequently report that the loss of "normal" laughter is not insignificant relative to the nature and effectiveness of social interactions.

Crying in Those Who Are Laryngectomized

Despite sharing a number of features from a physiologic perspective, crying is indeed different from laughing. Similar to laughing, crying necessitates a substan-

[9]One need only consider his or her group of friends and acquaintances to accept the notion that the manner of how one laughs is indeed as unique as the human voice itself and carries considerable satisfaction to the individual.

The Value of Phonation in CLP Population

The value of phonation in current society cannot be underestimated, and voice value is no longer restricted to singers, actors, preachers, or other professional voice users, but is of indisputable value to many people. It is now clear that voice and vocal emotions play an enormous role in social relations and may often be a factor in determining the extent of success, job placement, and societal status and even in the choice of a sexual partner or a mate. (For more on this subject see Chapters 13 and 15 in this volume.)

It is now evident that CLP voice quality can frequently be a cause of social exclusion (at all age stages) and can be a decisive factor in professional achievement or employment. When present, even discreetly, voice/speech problems can prevent the CLP patient from accessing the job market. Some of our patients report that even minor or discreet hypernasality and vocal stridency perceived by the listener on the phone can cause inquiry to the management by clients about the apparent deviancy of the speaker, or can simply result in a hang-up or aborted call or a request to speak to somebody else. (For more on the role of voice quality while on the phone see Chapter 8 of this volume.)

The voice and speech distortions present in CLP patients are often causative of reading difficulties, and are of importance in school settings for all CLP patients because of how teachers and peers react to their oral presentations (Richman, Eliason, & Lindgren, 1988). When a child with CLP is forced to talk or to read aloud in front of classmates, which is a particularly cruel task but which unfortunately happens rather frequently, this poses an enormous emotional burden on the child. In such a situation, a child with CLP may react by either increasing vocal efforts in an attempt to increase the chance of being understood, or by not being able to utter a single word. These efforts may manifest themselves in various types of vocal misuse, including excessive vocal hard attack, wrong voice pitch, excessive loudness, or combinations of all of these factors. If this defense behavior is frequently repeated it can create phonotrauma and form vocal fold edema, chronic laryngitis, vocal fatigue, muscular tension dysphonia, or vocal cord nodules. Those changes in turn will affect the voice quality, and the vicious circle continues.

Conclusions

The knowledge of how the voice in the CLP population hinders expression of emotions is not clear, judging from currently available literature. The data reviewed here show that vocalization in children with CLP may be tainted by intrinsic restrictions, hence providing false information about the emotive states of the speaker. We attempted here to show how important the knowledge of phonation is in consideration of how to improve treatment to provide the best anatomical condition for execution of nearly normal voice and speech. Based on our experience, we believe that early and properly executed palatal surgery may not only enable speech and language development under desirable anatomical and functional conditions, but can also prevent grave psychosocial maladjustment with all its consequences on the

cally to the control group on vocabulary, abstract reasoning, and basic cognitive functions, as measured by the Shipley Institute of Living Scales. This information, along with publications showing that emotional facial expression recognition is also deficient in detoxified alcoholics, indicates that emotion cognition is damaged by early alcohol abuse (Kornreich et al., 1998; Kornreich et al., 2002; Kornreich, Blairy, Philippot, Dan, et al., 2001; Kornreich, Blairy, Philippot, Hess, et al., 2001).

In addition, alcoholics also appear to be deficient in vocal production of affect (Monnot, Orbelo, et al., 2001). Four experienced raters listened to the vocal production of the 82 subjects in the alcohol abuse study (described above) and identified what emotion was projected using a forced choice of the six emotions represented in the Aprosodia Battery. Their inter-rater reliability correlation was 0.82. Results showed detoxified alcoholics were significantly impaired in their ability to produce understandable and accurate emotion in their speech [F (2,54) = 7.0, p = .0036]. In addition, these pragmatic ratings of subjects' ability to inject emotion into the voice show a positive, significant relationship to acoustic analyses assessing fundamental frequency variability [F (2,54) = 24.58, R^2Adjusted = 0.52, p < .0001]. A regression analysis showed a significant association between the Comprehension and Production components of the Aprosodia Battery for all 82 subjects [F (1,54) = 9.27, p < .003]. Subjects' sex, education, ethnic origin, and other drugs of abuse were not predictive of results. However, age was negatively associated with accuracy of affective prosodic repetition [F (1,54) = 4.96, p < .03] (Monnot, 2002; Monnot, Orbelo, et al., 2001). These results indicate that detoxified alcoholics (and those with putative prenatal exposure) are impaired in their ability to produce understandable affective prosody in speech and to comprehend emotion in the voice of a communication partner and, thus, this may explain partially the poor social skills and altered personal and work relationships so often noted in alcoholics.

Alzheimer's Disease and Affective Prosody

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by declines in memory and cognitive abilities, such as language and problem solving (McKhann, Folstein, Katzman, Price, & Stadlan, 1984). In addition to these cognitive deficits, some patients with AD experience disturbances in behavior, mood, and emotional regulation (Cummings, 1996; Piccininni, Baldereschi, Zaccara, & Inzitari, 2005; Shimabukuro & Matsuoka, 2005; Zubenko & McPherson, 2003). Patients with AD can have difficulty expressing and comprehending emotional information through facial expressions and affective prosody (Albert, 1991; Allender, 1989; Bucks, 2004; Cadieux, 1997; Cohen & Brosgole, 1988; Hargrave & Stone, 2002; Lavenu, 2005; Roberts, 1996), which worsen as dementia severity increases, and these deficits have been associated with mood and behavior disturbances (Allender, 1989; Roberts, 1996).

From a pathological standpoint, affective prosody deficits should reflect the underlying distribution and severity of neurofibrillary tangles. It is well known that in late-onset AD, pathological changes first appear in the medial and orbitofrontal

Introduction

It is commonly agreed that certain voice qualities, prosodic features, and temporal vocal characteristics are associated on an almost universal basis with perception of specific emotions, like anger, joy, fear, happiness, and sadness (Shearer, Banse, & Wallbott, 2001). When vocalization is affected by pathological processes, the resultant dysphonic voice assumes deviant qualities, some of which may approximate the voice qualities associated with various emotive states. Hence, even during an emotionally neutral speaking condition a dysphonic patient may sound as if he or she is expressing a specific emotion, when indeed there is no such intent on the part of the afflicted speaker. The situation may be even more convoluted when the vocal condition does not match the gender of the speaker. Moreover, with certain pathological conditions, this incongruence is more pronounced when speaking on the phone, and may be amplified further in face-to-face conversation, the latter occurring when the accompanying facial expressions bring the total percept (voice-face-posture) closer to the assumed emotional quality, or when they are in conflict with the acoustic signal produced.

The scenario of voice-gender mismatch is typical when a female voice drops to a low F_0, whether due to polypoidal vocal cords, or a virilized voice, or a person who looks female but has a male voice quality (in a transgender patient; Flower & Izdebski, 1979; Izdebski, 2007).

The emotional mismatch scenario can be present in a variety of dysphonias, and can be amplified further in neurological cases such as in the various dystonias and dyskinesias, in various craniofacial anomalies, or in Parkinsonian syndrome patients, where facial expressions do not match the intended vocal signals. This mismatch, when present in nonpathologic populations, is known as the McGurk effect (McGurk & MacDonald, 1976).

In this chapter I will discuss how the pathologic voice may be misinterpreted by the naïve listener as being indicative of a "wrong" emotional or physical state that is not representative of the dysphonic patient. I will demonstrate that this scenario often brings serious embarrassment to the afflicted patient (the producer) and the listener alike, and in many cases carries profound psychosocial consequences for the afflicted patient (Krischke et al., 2005).

Vocal Movement Dysphonias

Typical vocal movement dysphonias include focal dystonia of the larynx represented by adductor (ADDSD) and abductor (ABDSD) spasmodic dysphonia, vocal tremor, or mixed ADDSD with VoT (Izdebski, 1981; 1992; 1997; Izdebski & Ward, 1997). In all these conditions, symptoms are organized phonetotopically, meaning that the voice can be normal or abnormal depending on predictable F_0/dB levels or as a function of phonemic context (Izdebski, 1996; 2007).

ADDSD

The distinguishing quality of ADDSD is vocal overpressure (Izdebski, 1992). Overpressure results from increased glottic compression and increased subglottic pressure (Alku, Svec, Vilkman, & Sram, 2000; Shipp, Izdebski, & Schutte, 1988).

conversational appropriateness to the brain dysfunction associated with PD.

The Parkinsonians in this study were also asked to rate their pragmatic skills on an auto evaluation scale. The spouses also rated the pragmatic skills of their affected partners with the same scale. The comparison of the results indicated a lack of awareness of the pragmatic difficulty in the patients. However, the same analysis was not conducted in the control group, and the results might need to be interpreted with care.

Steinert's Disease

Steinert's disease is a hereditary myotonic atrophy. It is characterized by a slowness and a difficulty in relaxing the muscles during voluntary movements. It is not accompanied by pain but is accentuated by cold and fatigue. The severity of the disease is variable from one individual to the other and ranges from a minimal functional impairment to an inability to walk. Observed symptoms are repeated infections of the respiratory system, a perturbation of the cardiovascular apparatus (particularly the heart), and ocular symptoms such as cataracts. The central nervous system and the endocrine system are also often impaired. The disease touches various muscles and particularly the ones of the hand, the mouth, and the tongue. This yields chewing and swallowing difficulties as well as vocal difficulties. The voice is monotone and nasal. The mouth is often slightly opened and the cheeks are hollow.

In a study by Morsomme et al. (2007), the vocal and facial emotion expression of a patient with Steinert's disease was compared to an actor's. The patient's complaint, besides an action myotony increasing with cold, swallowing problems, and a general fatigue, was his difficulty in adopting a facial mimicry reflecting his oral message. This is impairing his professional occupation, where he is often leading meetings. The facial mimicry of the patient is affected by the muscular rigidity caused by his myotonic dystrophy. On the vocal level, articulation difficulties and a characteristic hyponasality are observed. In order to establish the origin of the deficit of emotion expression in the patient, it was important to isolate the different channels of emotion expression according to the three modes: audio, visual, and audiovisual.

The tasks of the two subjects included reading a neutral content text with four different emotions: joy, anger, sadness, and fear, and with a neutral expression. The two subjects were recorded during the task and the recordings were then judged by adult and adolescent raters regarding the category of the expressed emotion and the intensity of the expression.

The results showed that the actor obtained higher ratings than the patient in the gradation of the intensity. As for the categorical choice, there was no significant difference between the subjects, except for the visual mode. The judges had difficulties identifying the expressed emotions on the sole basis of the patient's facial mimicry. That corroborates the authors' hypothesis that the patient's deficit would impair the judges' ability to correctly identify the emotion. It also objectivated the patient's self-reported difficulty in adopting a facial mimicry that reflects his intended message. The low intensity scores yielded by the patient as compared to the actor also suggest a certain difficulty for him to clearly express his emotions, on both the facial and vocal level.

the mother's voice (Piontelli, 1992). All of this begins to occur around the age of 4 months and is experienced while floating in the amniotic fluid, which also amplifies the internal and external sounds.

Research has shown that shortly after birth, infants turn their heads in the direction of the mother or the father whose voice they heard while in the womb (DeCasper & Fifer, 1980). Therefore, an imprint of the timbre, pitch, and melody of the familiar voice appears to be encoded in the infant, although it is difficult to specify how that early experience affects the developing brain-mind of the fetus. Once a child is born, these intoned words are experienced within a rich mix of nonlinguistic sounds, facial expressions, gazes, gestures and physical holding, caressing and touching—all of which make up the sensory-motor-affective matrix of our earliest experiences of other human beings, the world, and our nascent self.

Prosody includes vocal rhythm, pitch, melody, tempo, and volume as part of the communication of linguistic and paralinguistic (emotional and attitudinal) information. This prosodic "speech" is characterized by elevated pitch, simplified pitch contours, expanded pitch range, decreased tempo, and repetitiveness that convey meaning by varying stress and pitch irrespective of the words and grammatical construction (Mitchell, Elliott, Barry, Crittenden, & Woodruff, 2003).

Prosody is thought to be processed mainly in the right brain along with other crucial socio-emotional information and body states that are central to the regulation of emotions and the origin of a sense of self (Schore, 2005a). This right brain regulatory capacity is dependent on experience—particularly the experience of attunement and synchrony with a caregiver— and develops primarily nonverbally through playful interactions involving gesture, rhythm, melody, tempo, facial expressions, and movements that form patterns of interactions between the developing child and others. A mother's rhythm, melody, pitch, volume, and tempo are ideally finely tuned to the infant's needs and response; even deaf mothers vocalize to their young deaf infants, although neither can hear the sounds (Sieratzki & Wolf, 1996).

Researchers in the field of infant development and linguistics state that the most essential aspects of prosody occur during the preverbal period of infancy and that music is instrumental to the development of language in that the ordering of pitched sounds made by the human voice is the first thing we learn when acquiring a language (Papousek, 1996). It has also been claimed that it is difficult to discern which sounds made by infants are premusical and which are prelinguistic and that this lack of clear distinction continues throughout the language and music acquisition processes. Starting at around 2½ years, they begin to separate out into language as the means of communicating semantic content and meaning, with music and prosody continuing to represent and express emotional content and meaning throughout the lifespan (Steinke, Cuddy, & Holden, 1997).

The Intersubjective Musical Matrix

Bargiel (2005) states that most developmental researchers believe that we are born with a biological predisposition for

investigate physiological stress reactivity patterns in extroverted and introverted individuals and the specific role of neuroticism in that context.

In addition, results from research on the relation between type A personality, as predominantly seen in males, and speaking style and facial behavior can be informative. Type A personalities are characterized by an aggressive and hostile attitude, including nonverbal facial tension such as teeth-clenching (Chesney, Ekman, Friesen, Black, & Hecker, 1997). Research on speaking style has shown the largest differences between type A and control personalities for syllabic emphasis, voice loudness, voice harshness, hostility, and speaking rate, indicating an increase in all of these factors with type A personality (Chesney et al., 1997). Interestingly, investigations on psychological characteristics of patients with vocal fold granulomas seem to parallel these results (Kiese-Himmel, Pralle, & Kruse, 1998). Thus, future research could incorporate the type A construct as a potential predictor of some voice disorders.

Psychopathology in Voice Disorders

Although stress and anxiety are closely related, stress can be present without concurrent psychological distress such as anxiety and depression (Cohen & Williamson, 1988). However, allostatic load or chronic stress can be conceptualized as a precursor predicting a risk for *future* psychiatric disease (Cohen, Kamarck, & Mermelstein, 1983). More specifically, research has investigated the relation between stress and psychiatric diseases and results have pointed to a stress-induced, biological basis of anxiety and depression, by way of HPA dysregulation (Cohen et al., 1995).

A recent study obliquely related to this notion was conducted on the frequency of perceived stress as compared to anxiety and depression in patients with voice disorders (Dietrich, Verdolini, Gartner-Schmidt, & Rosen, in press). The study aimed to explore (a) the relationship between stress and laryngeal diagnosis, and (b) the relation between stress and anxiety and depression in relation to laryngeal diagnosis. Two hundred eighty-one new patients (65% female) presenting to a voice center completed self-report questionnaires that assess perceived global stress within the preceding 1 month (Perceived Stress Scale-10, PSS-10; Cohen & Williamson, 1988) and anxiety and depression based on symptoms from the preceding week (Hospital Anxiety and Depression Scale, HADS; Zigmond & Snaith, 1983). Findings indicated the following results. About 25% of all patients with MTD (primary and secondary) and vocal fold lesions, about 30% of patients with laryngopharyngeal reflux (LPR), and about 40% of patients with paradoxical vocal fold motion disorder (PVFMD) produced stress scores equal to or greater than one standard deviation above the mean for normative data. Further, fully 50% of all patients with vocal fold lesions, PVFMD, LPR, and primary MTD (as compared to about 30% of patients with secondary MTD), had at least mild anxiety. Only a small number of patients had depression scores indicating at least mild depression: about 15% of patients with primary MTD and PVFMD and 10% of all other patients. In comparison, patients with glottal insufficiency due to paralysis and other causes had significantly lower stress and anxiety scores compared to

subjects in other diagnostic categories, and also had the lowest depression scores. In conclusion, primarily elevated anxiety and to a lesser degree stress appeared to co-occur with voice disorders in roughly the following descending order of magnitude of relation: PVFMD, LPR, vocal fold lesions, and MTD (Dietrich et al., in press).

Only one other study of which we are aware investigated the prevalence of *adjustment-related stress*, anxiety, voice use, and somatic complaints in a population of individuals with voice disorders (Schedule of Recent Experiences, SRE; Davis, Eschelman, & McKay, 1988; Goldman et al., 1996). In that study, patients with vocal fold nodules showed no higher stress scores compared to controls, whereas a comparison group composed of individuals with hyperfunctional voice disorders (MTD, vocal fold lesions other than nodules) did show higher stress scores. In addition, both groups showed higher state and trait anxiety scores as compared to healthy controls (Goldman et al., 1996).

Comparing the two studies, the commonalities are elevated anxiety scores for individuals with hyperfunctional voice disorders with and without lesions. Results surrounding stress are weaker and less easily comparable, but research should pursue the relationship between anxiety and stress in voice disorders. The pervasiveness of anxiety and stress in individuals with voice disorders is striking, and possibly may influence the occurrence and maintenance of a *wide range of voice disorders* relevant in clinical practice. However, no causality can be implied at this point, based on the noted cross-sectional studies, and no predictions can be made about risk factors for future voice disorders due to anxiety or stress. Further, the likely bidirectionality between stress and voice disorders on one hand, and voice disorders and stress on the other hand, makes it difficult to disentangle the pathways. For instance, it has been established that voice disorders decrease an individual's quality of life (Smith et al., 1996), and thus may increase stress.

Physiological Pathways in Voice and Stress

Past research around psychological factors involved in certain individuals with voice disorders has focused primarily on personality issues and psychopathology using self-report measures as previously discussed, and on the general importance of stress in professional voice users (Rosen & Sataloff, 1997). New frontiers for investigation include studies around (a) the *specific role of stress* in voice disorders, and (b) the potential *pathways* by which stress may affect voice. Stated differently, no *physiological or biological* research exists to date of which we are aware that specifically studies the link between stress and voice disorders using a psychobiological framework incorporating complex stress-emotion-voice interactions. However, recent work has made some forays in that direction. For example, one study looked at the effects of "vocal constitution" (i.e., dynamic range), autonomic reactivity, and state and trait anxiety on vocal endurance in female student teachers without vocal complaints (Schneider et al., in press). Interestingly, autonomic stress reactivity did not predict fundamental frequency changes during actual teaching in the classroom—although it should be noted that other vocal parameters

Vocal Expression of Emotions in Normally Hearing Infants

Up to now, studies that focus on the question of to what extent infant vocalizations contain information about different emotional states were done mainly on crying behavior. The results of these studies are controversial. According to Wasz-Höckert et al. (1968), four types of cries can be discriminated: birth, hunger, pain, and pleasure cries. However, Muller et al. (1974) and Murry et al. (1975) reported that mothers were not able to identify the stimulus that elicited crying in their infant. Other authors suggest that infant crying is a graded signal, mirroring a continuum of emotional states reaching from arousal to urgency (Brennan & Kirkland, 1982; Porter, Miller, & Marshall, 1986; Protopapas & Eimas, 1997; Zeskind, Sale, Maio, Huntington, & Weiseman, 1985). Porter et al. (1986), for instance, investigated infant cries during painful circumcision procedures. They found correlations between the acoustic structure of the elicited cries and the degree of intrusiveness of the particular procedure. In the perceptual test, the cries elicited by the most intrusive procedures were judged by adult listeners also to be the most urgent ones.

According to Keller and Schölmerich (1987), parents interpret the vocalizations of even 2-week-old infants as expressions of emotional states and respond in a differentiated way to different vocalizations. There is no general agreement, however, whether infants during their first months of life are able to express specific emotions in their behavior at all (for an overview, see Strongman, 1996). Some authors suggest that, in the first months, the expressive behavior is to a large extent random. This assumption is based on the observation that specific vocal or facial patterns often occur without a specific stimulus preceding them (for an overview, see Camras, 1994). One reason for this low predictability of specific behavior patterns could be a low degree of emotional differentiation in early infanthood. Most authors agree that from the very beginning, there is a differentiation into at least two emotional states: aversive and nonaversive (Giblin, 1981; Izard & Malatesta, 1987; Lewis, 1993; Malatesta-Magai, Izard, & Camras, 1991; Sroufe, 1979). Some authors, however, argue that more than two emotional states can be distinguished (Giblin, 1981; Izard & Malatesta, 1987; Malatesta-Magai et al., 1991). This disagreement about the expression of infant emotions may be partly due to the difficulties in estimating the emotional state of an infant, because we rely on assumptions about the infants' internal state. These assumptions can be strengthened by contextual information (e.g., certain contexts in which specific emotions are probable), or by comparing the facial expressions of infants with the facial expressions of emotions of adults (see Ekman & Oster, 1979; Izard, Huebner, Risser, McGinnes, & Dougherty, 1980). A further possibility to judge the emotional state of infants is to use their parent's ratings (Wasz-Höckert, Lind, Vurenkoski, Patanen, & Valannen, 1968), since in a communication process the receivers of a signal should be able to decode the transmitted information.

In our study (Scheiner et al., 2002; 2004; 2006), we used a combination of parent ratings and contextual information to judge the emotional state of the infants. We tested the four most common

= 3.66; for Unit B, M = 26.57 s, SD = 4.76; and for Unit C, M = 31.83, SD = 5.4).

Each vocal data set was analyzed with CSL (Computerized Speech Lab, model 4300 B, software version 5.X, Kay Elemetrics Corp.) for 11 acoustic parameters regarding time (rate of articulation), pitch (fundamental frequency, F_0), and energy (intensity in dB). For both pitch and energy, the mean, range (gamma +, gamma −), and standard deviation were calculated.

Furthermore, the vocal data were subjected to a participant-by-participant analysis, to determine the vocal profiles of the male seducers (Ekman, O'Sullivan, Friesen, & Scherer, 1991). This analysis only took into consideration variations between each individual participant's own speech samples. In this way, each participant effectively acted as statistical control for himself. Thus, different categories of participants were identified from the analysis of the variations from the respective baseline values. The analysis consisted of (a) quantification of the differential values of each participant (i.e., the differences between the raw values of the seductive speech units and the raw values of the baseline speech); (b) calculation of the differential threshold for the definition of the vocal profile categories (the differential threshold value was equal to or greater than twice the standard error); and (c) the definition of the vocal profile categories as "participants +" (those who had positive differences equal to or greater than twice the threshold value), "participants −" (those who had negative differences equal to or greater than twice the threshold value), or "participants =" (those who showed positive or negative differences lower than twice the standard error). Based on this analysis, several further categories were identified for the vocal profiles (high-pitched, low-pitched, variable, monotone, and intermediate voice for pitch; loud, soft, variable, stable, and intermediate voice for energy; fast, slow, and intermediate rate of articulation).

Main Vocal Features of Seduction

As general result, the voice of seduction in the standard utterance was characterized by a high modulate pitch (F_0 = 156.32), loud speech (dB = 58.23), and a fast rate of articulation (M = 8.97 syllables/s). Generally, when inviting the partner to meet him again, the potential seducer spoke at a higher pitch, higher intensity, and accelerated rate of articulation, compared to his standard speech.

More interestingly, the temporal disposition of the vocal profiles in three periods (beginning, middle, and end) of the experimental situation revealed the richness of vocal variations in the seductive behavior of the male participants. At the very beginning, most participants (57.89%) spoke in a higher voice than they did in baseline speech, whereas only a minority (15.79%) lowered the pitch. In any case, all participants tended to modulate their pitch in a variable way. Conversely, in the middle period, there was a drop in the percentage of participants who spoke at a high pitch (26.32%) compared to those who spoke at a low or intermediate pitch. During this period, the voice became more monotonous. In the final period, an increase in the trend shown in the middle period was observed: participants spoke to the partner with a low and monotone (whispered) pitch.

As regards voice intensity, initially most participants (52.63%) spoke at a

high volume intensity with a loud and variable voice, whereas only a minority (21.05%) spoke in a low-intensity voice. In the middle period, the vocal condition was reversed and most participants (57.89%) spoke at a low volume, using a variable soft voice. In the last period, most of the participants spoke consistently at a lower volume.

With regard to speed (rate of articulation), in the first period only a very small minority (5.26%) spoke slowly, while most participants (94.74%) spoke at a medium or fast rate. In the middle period, there was an increase in the number of participants who spoke slowly (21.05%). Conversely, in the last period, the number of participants who spoke quickly increased (52.63%),

In sum, during the seductive interaction, the male partners produced a high level of vocal variations, as revealed by the participant-by-participant analysis. At the very beginning of the interaction, most of participants spoke louder and at a higher pitch than their standard. In the middle and at the end of the interaction, their voices became progressively lower and softer. Conversely, the rate of articulation increased constantly during the seductive process, even more so at the end.

The Voice of Successful and Unsuccessful Seducers

The follow-up data enabled the "efficacy" of the seductive strategies used by male participants during the experimental situation to be tested. On the basis of this efficacy, it was possible to distinguish between successful and unsuccessful seducers, as outlined above. As shown in Figure 13–2, the differences between the vocal cues employed by successful and unsuccessful seducers during the seductive interaction were general and marked.

As regards pitch, at the very beginning, most of the successful seducers spoke at a high pitch and none used a low pitch, whereas more than half of those unsuccessful spoke at a low or medium pitch. In the middle of the interaction, the percentage of successful seducers who spoke at a high pitch dropped compared with the previous period, while only 14.29% of them spoke at a low pitch. Conversely, more than 90% of the unsuccessful seducers spoke at a low or medium pitch in the middle of the interaction. This trend continued into the last period for the unsuccessful seducers, while the successful seducers changed their voice, lowering further their pitch.

As far as intensity is concerned, at the start of the interaction, successful seducers spoke in a loud voice, whereas only 41.67% of unsuccessful ones spoke loudly, and 25% spoke at a low volume. In the middle of the interaction, the successful seducers reduced the intensity of their voice (only 14.29% went on speaking in a loud voice, while 42.86% spoke in a soft voice). Among the unsuccessful seducers, a greater percentage lowered the volume of their voice in the middle of the interaction. In the last period, this trend was consolidated by the unsuccessful seducers (75% of them used a low-intensity voice), while the successful ones spoke at a medium intensity.

With regard to the rate of articulation, most of the successful seducers spoke quickly and none spoke slowly at the beginning of the interaction. Conversely, only one third of unsuccessful seducers spoke quickly. In the middle of the interaction, successful seducers markedly

higher VDI scores than those with passive/maladaptive coping (median VDI = 21.3). In conclusion, the results show a strong tendency for the vocal arousal to be associated with the patients' coping style.

Theoretical Framework for Measuring Vocal Indicators of Coping Styles

The patient's way of coping with illness is of major importance for both psychosocial (e.g., well-being) and biomedical (e.g., compliance with treatment) aspects of the disease. Obrist (1981) described *passive coping* as a state of enduring a stressor without expending effort to act upon it, while *active coping* was defined as tonic readiness to act upon an event. This corresponds to the action readiness dimension of Cannon's emergency response (Cannon, 1929). Generally speaking, active coping styles are thought to be more appropriate for dealing with stressful events, while avoidant coping appears to be a psychological risk factor from a long-term perspective (Holahan & Moos, 1987).

An important determinant of coping reactions is the *feeling* of potency or control over the illness. The feeling of control, or lack of control, can induce cognitive-affective states of hopefulness or hopelessness (Ortony, Clore, & Collins, 1988, p. 132) and thus significantly influence the patients' coping reactions, which include both somatic and autonomic reactions. The latter can be induced by anticipated activity (Obrist, Webb, Sutterer, & Howard, 1970). ß-adrenergic sympathetic effects on the heart have been found to predominate during active rather than passive coping, particularly when environmental uncertainty and behavioral uncertainty are high (Bongard, 1995; Brener, 1987; Kelsey, 1991; Kelsey et al., 1999; Light & Obrist, 1980; Sherwood, Allen, Obrist, & Langer, 1986). Obrist (1981) also provided evidence regarding the role of parasympathetic physiological reactions in subjects with passive coping style.

As voice and speech production mechanisms (respiration, phonation, and articulation) are strongly influenced by the subjects' autonomic reactions, studying the patients' vocal expression appeared to be a more direct method of assessing the emotional factors associated with coping styles.

What Is Measured: The Voice of Full-Blown Emotions or the Voice of Affective Dimensions?

Research on vocal indicators of affective states has been dominated by designs based on the relations between acoustic features and semantic tasks of emotion labeling. Psychologists and speech scientists rely on the subjects' intuitive labeling of the states called "emotions," often in forced choice recognition tasks (Cowie & Douglas-Cowie, 1996; Kienast & Sendlmeier, 2000; Mozziconacci & Hermes, 1999; Pereira, 2000; Schröder, 2001; Yuan,

Introduction

Quite independent of the content of speech, the tonal features of the human voice convey a rich array of nonverbal information about the speaker. Consider, for instance, answering the telephone as a case in point. Even though you may not know or have ever met the person who is calling, as soon as he or she starts to talk, you can immediately tell if you are speaking to a male or a female, or to an adult or a child.

Voices contain much more embedded information than just gender and developmental status. Studies have shown that listeners who hear voice samples can accurately infer the speaker's race (Lass, Tecca, Mancuso, & Black, 1979), gender (Lass, Hughes, Bowyer, Waters, & Bourne, 1976), socioeconomic status (Ellis, 1967; Harms, 1963), personality traits (Addington, 1968; Allport & Cantril, 1934; Zuckerman & Driver, 1989), and emotional and mental state attributes related to deception (Ekman, Friesen, & Scherer, 1976; Streeter, Krauss, Geller, Olson, & Apple, 1977). Listeners are also capable of estimating the age, height, and weight of speakers with the same degree of accuracy achieved by examining photographs (Krauss, Freyberg, & Morsella, 2002; Lass & Colt, 1980; Lass & Davis, 1976). Independent raters are capable of matching a speaker's voice with the person's photograph over 75% of the time (Krauss et al., 2002). Furthermore, there is evidence that the sound of an individual's voice is an external attribute that is used as a cue for assessing potential mates and plays an important role in interpersonal attraction (Miyake & Zuckerman, 1993; Oguchi & Kikuchi, 1997).

Voice Attractiveness

What makes some voices sound more attractive than others? There have been a variety of investigations on this matter using acoustic and sound spectrographic analyses, but, as yet, no one has been able to identify or agree on all of the physical properties that distinguish attractive from unattractive voices. For instance, with regards to pitch, Daniel and McCabe (1992) found that both sexes rate mid-pitch voices as being the "most sexy," whereas Oguchi and Kikuchi (1997) found that both sexes evaluated a low-toned voice with a small pitch range as attractive, but the exact opposite was shown by Oksenberg, Coleman, and Cannell (1986), where a higher pitch with greater variation was associated with voice attractiveness.

Whatever the underlying tonal/acoustic features may be that constitute attractive voices, there is high inter-rater reliability (i.e., consensus) with regards to which voices sound attractive (Hughes, Dispenza, & Gallup, 2004; Hughes, Harrison, & Gallup, 2002; Zuckerman & Driver, 1989; Zuckerman, Hodgins, & Miyake, 1990). Not only do people tend to agree about which voices are attractive, they are usually capable of making this decision as soon as they hear a person begin to talk. In addition, individuals rate the attractiveness of same-sex and opposite-sex voices with the same degree of consensus (Addington, 1968; Hughes et al., 2002).

Vocal attractiveness appears to exert an influence on mate selection, and individuals with voices that sound attractive are perceived as having more desirable personality characteristics (Zuckerman & Driver, 1989). Individuals with attrac-

tive voices are thought to be warmer, more likable, honest, dominant, and more likely to achieve (Berry, 1990; Zuckerman & Driver, 1989). Thus, a "vocal attractiveness stereotype" appears to exist (Zuckerman & Driver, 1989; Zuckerman et al., 1990). Furthermore, the higher the rating of vocal attractiveness, the more similar the speaker is judged to be to like the listener and the more the listener would like to affiliate with the speaker (Miyake & Zuckerman, 1993). Favorable impressions of speakers with attractive voices have been obtained under conditions where observers only heard the speaker's voice, as well as when they both saw and heard the speaker (Miyake & Zuckerman, 1993).

There is evidence suggesting that reliable impressions of other personality attributes can also be inferred on the basis of the sound of a person's voice (Allport & Cantril, 1934; Berry, 1990; Zuckerman & Driver, 1989). Addington (1968) found that when making inferences about personality based upon vocal samples, the average inter-rater reliability coefficient was a .81 across 40 measured personality traits. When listeners form an impression of the speaker's personality traits, they are influenced more by the speaker's tone of voice than by the content of the speech (Yogo, Ando, Hashi, Tsutsui, & Yamada, 2000). Furthermore, the effects of manipulating a single vocal sample by changing the rate, mean, and variance of fundamental frequency all showed a corresponding change in personality ratings (Brown, Strong, & Rencher, 1974).

Most studies that investigate vocal attractiveness use voice samples that are neutral (such as a standardized sentence, word count, or vowel recitation) and attempt to control for such things as content, speech patterns, dialect, accents, visual information, intonations, and inflections (Collins & Missing, 2003; Daniel & McCabe, 1992; Hughes et al., 2002; Hughes et al., 2004; Zuckerman, et al., 1990; Zuckerman & Miyake, 1993). But in certain contexts, it can be argued that it is possible that individuals modify their vocal patterns in order to persuade, seduce, or influence potential mates. For example, there is evidence showing that males' vocal style in seductive speech produces a profile that differs significantly from the one used in normal speech (Anolli & Ciceri, 2002). On the other hand, the sound of a person's voice can only be manipulated within limits, and much of the variance in vocal quality is undoubtedly influenced by one's biology and genetic makeup. (To learn more about vocal attractiveness, see Chapter 2 in Volume 1: Editor.)

Voice and Physical Features

A person's voice not only conveys psychological information about that person, but it can also reveal information about one's basic biological features. For instance, both height and weight can be inferred from a person's voice with the same degree of accuracy as viewing a photograph (Krauss et al., 2002; Lass & Colt, 1980; Lass & Davis, 1976).

There are also several studies showing that ratings of voice attractiveness predict certain physical features. For instance, we have shown that voice attractiveness is related to bilateral symmetry. Individuals who possess symmetrical bilateral traits (such features as length of the fingers, hand widths, etc.) tend to have

thyroarytenoid, bilateral depressor anguli oris, procerus/corrugators, and frontalis muscles were injected. This has resulted in moderate improvement in her dysphonia and reduction in unwanted facial contortions. She is pleased with the results and continues to return for periodic injections.

Summary and Conclusions

Several clinical conditions can cause significant disruptions of voice, speech, and associated facial expression that are difficult to correct purely through behavioral or speech therapy. These conditions can also affect emotive expression in these patients either by introducing unwanted representation of emotion, especially during declarative speech, or by magnifying intended emotions. The idea for using botulinum toxin type A injections was based on our long history of treating ADDSD using these techniques. The use of these injections in MD patients has been described before (Arikan et al., 2006; Rapaport et al., 2000; Schneider et al., 2006; Suskind & Tilton, 2002; Tarsy et al., 1997). Botulinum treatment of drooling in CP patients has been reported (Arikan et al., 2006), but not for vocal or facial problems. Finally, we were not able to locate any reports of the use of this therapy for these indications in CHI patients (http://www.ncbi.nlm.nih.gov/PubMed), May, 2007. Our results have been encouraging to date. In select patients manifesting these problems, botulinum toxin injection therapy may prove useful. All three of our patients feel they have benefited and have continued periodic treatment for over a year. Specifically, patients with spasmodic-like dysphonias and facial grimacing and in particular who experience difficulty with emotional expression may benefit from this therapy.

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ence; in the long term being estimated as an excellent singer, actor, lawyer, teacher; earning a living as a professional voice user;
- On a creative level: the intrinsic pleasure of mastering a technique, putting on a vocal performance that transcends the ordinary; in the long term spiritual well-being or fulfillment.

The negative effects of maladaptive behavior are:

- On a physical level: vocal fatigue, vocal discomfort, and edema of the vocal fold can be defined as short-term, and vocal nodules as a long-term effect of vocal misuse and abuse;
- On a personal level: doubts about one's social position, occupational incapacity; in the long term work incapacity;
- On a creative level: suffering from burnout.

To summarize: the dynamic stress chain consists of: stressors; neuroendocrinocrine reactions; physical signs and organic changes; cognitive aspects, feelings, and emotions; instrumental behaviors; short- and long-term effects, which meet to some extent the needs of safety, security, and creativity.

Figure 18–1 and Figure 18–2 summarize the biological and mental stress chain.

Interaction of Biological and Mental Activation

The interaction of primarily biological and mental excitement and the most common types of secondary kinesthetic emotional excitement are listed in Table 18–1.

Interference of Stress with Vocal Performance

The obvious relationship between vocal communication and stress is commonly stated (Brockway, 1979). Even in the field of aviation and space medicine there exist data about the correlation of voice pitch with emotional excitation (Johannes, 1994; 1995; Ruiz, 1990).

Stress affects the physiological and motor mechanism of vocal performance (Sundberg, 1987). This is reflected in several acoustic parameters such as pitch and intensity variations, vocal range (Seidner, 1981), timbre and prosodic changes, jitter, shimmer, (Fuller, 1992; Mendoza, 1998), duration of the syllables, and other speech aspects (Engstrand, 1988; Fuller, 1992). Moreover, voice and speech modulations are the vehicles to communicate, for adequately expressing the broad spectrum of human feelings and emotions. The listener can easily detect the emotional state of a speaker and singer just by listening and watching the mimic (Sundberg, 1987). Voice, posture, and mimic are very precise emotion indicators. The emotional state of a speaker and singer has a considerable effect on the way the vocal tract is used (Cosmides, 1983; Sundberg, 1987).

Changes of fundamental frequency (F_0), in particular, have significant relationship with emotional load. The maximum F_0 constitutes the primary indicator of the perception of emotional stress (Cosmides, 1983; Protopapas, 1997; Wittels, 2002).

The influence of life events has been shown to have an important effect on the etiopathogenesis of functional dysphonias (Butcher, 1993; Freidl, 1990; 1993; House, 1988). Voice pitch mode

is to analyze the information contained in characters' voices in foreign films or soap operas and even news announcers transmitting happy and sad events. More important than identifying the vocal psychodynamics characteristics is to use this information positively to improve communication competence.

Vocal Psychodynamics Approach

The goal of the Psychodynamic Approach (PA) is to offer feedback to let patients recognize the specific impact of their voice on the listener. The patient is guided in identifying the revealed impact, and the clinician makes it clear that vocal parameters are conditioned throughout the life or may be the result of a pathology and do not always represent the patient's emotion or true nature. For this process, examples can provide a great help: a loud voice is common in children that grow up in noisy families; fast speech rate may be due to stressful situations; uncoordinated breathing can be due to a vocal fold paresis and not to anxiety; rough voice can be the result of a distorted mucosal wave from vocal nodules and not due to an abrasive manner. So, it's important to make the patient comprehend that the psychological impact does not always represent the real self; for example, a closed jaw articulation delivers aggression even if the cause is temporomandibular joint dysfunction.

Voice is a primary and automatic instrument for emotional expression, because it has a physiological basis and a communicative function (Scherer, 1995). The voice clinician must be aware that any behavioral change is submitted to the psychological acceptance of the patient. Voice is a strong mirror of one's self. Everybody influences and is influenced by others' vocal patterns. To omit consideration of the vocal psychodynamic of a dysphonic patient can restrict or even impair the vocal rehabilitation outcome.

Table 19–1 summarizes the main naïve interpretations of different types of voice, and Table 19–2 matches frequent vocal problems and common features to their main vocal psychodynamics interpretation.

Table 19–1. Type of voice and main vocal psychodynamic interpretation

Type of Voice	Main Interpretation
Roughness	Aggression, anger, and/or fatigue
Breathiness	Fatigue, sensuality (discrete deviation), lack of power, and/or shyness
Strain	Effort, difficult life, relationship problems, and/or distress
Nasality	Sensuality (discrete deviation), lack of social skills, and/or limited intelligence
Tremulous	Emotional liability, lack of confidence, conflict, and/or fear
Asteny	Lack of energy, shyness, and/or lack of social skills or confidence
Creaky/Basal	Aggression, attempt to control or to express power, villainy