



## Review

## Attitudinal prosody: What we know and directions for future study

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## ABSTRACT

Prosodic aspects of speech such as pitch, duration and amplitude constitute nonverbal cues that supplement or modify the meaning of the spoken word, to provide valuable clues as to a speakers' state of mind. It can thus indicate what emotion a person is feeling (emotional prosody), or their attitude towards an event, person or object (attitudinal prosody). Whilst the study of emotional prosody has gathered pace, attitudinal prosody now deserves equal attention. In social cognition, understanding attitudinal prosody is important in its own right, since it can convey powerful constructs such as confidence, persuasion, sarcasm and superiority. In this review, it is examined what prosody is, how it conveys attitudes, and which attitudes prosody can convey. The review finishes by considering the neuroanatomy associated with attitudinal prosody, and put forward the hypothesis that this cognition is mediated by the right cerebral hemisphere, particularly posterior superior lateral temporal cortex, with an additional role for the basal ganglia, and limbic regions such as the medial prefrontal cortex and amygdala. It is suggested that further exploration of its functional neuroanatomy is greatly needed, since it could provide valuable clues about the value of current prosody nomenclature and its separability from other types of prosody at the behavioural level.

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## 1. What is prosody?

Nonverbal aspects of communication add value to verbal communication (Schul and Lamb, 1982), and may be the way we have been equipped by evolution to signal our authentic feelings (Turner, 2002). Thus, auditory nonverbal cues may be just as important as visual ones (Borod, 1993). Indeed in certain situations (e.g. telephone calls) facial cues are not available (Barath and Cannell, 1976). In the auditory modality, manipulation of communication partners' perception can be achieved with carefully chosen words but,

equally important may be the way in which these words are spoken, i.e. the tone of voice used.

Tone of voice is a pragmatic language function; an umbrella term that concerns the ways in which context contributes to meaning. Grice thus distinguishes between 'sentence meaning' (semantic properties of a communication assigned by grammar) and 'speaker's meaning' (what the speaker intended to communicate by their utterance) (Grice, 1989). Understanding sentence meaning simply requires one to decode the utterance, but understanding speaker meaning involves attributing the intention of producing a cognitive effect, by causing the audience to recognise that intention (Noveck and Reboul, 2008). In research literature, tone of voice is typically referred to as 'prosody', a term that refers to suprasegmental aspects of speech that are paralinguistic. These features encompass changes in intonation, amplitude envelope,

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tempo, rhythm and voice quality (Grandjean et al., 2006), although dynamic change in pitch is the most important (Balaguer-Ballester et al., 2009; Ross et al., 1986, 1988). According to Monrad-Kohn, spoken narratives thus contain three main elements: the spoken words (vocabulary), their declination, conjugation and correct placing in phrases (grammar), and their variations in pitch, rhythm and stress of pronunciation (prosody) (Monrad-Kohn, 1963). Prosody is that aspect of communication that creates emotional tone, subtle grades of meaning and slightly varied emphasis in spoken word (Boss, 1996). One of the most well-known groupings suggests that four different types of prosody can be distinguished (Monrad-Kohn, 1947). Intrinsic prosody includes linguistic uses of prosody e.g. the demarcation between a question or statement, and also creates dialectical (regional) and idiosyncratic differences in speech quality that give rise to voice patterns and qualities that are unique to an individual. The speaker's attitude about the information being conveyed (e.g. scepticism, doubt, enthusiasm, boredom etc.) is intellectual prosody. Intellectual prosody encodes attitudinal information in discourse that may drastically alter meaning. The emotion conveyed by tone of voice in the communication (happiness, sadness, fear etc.) is known as emotional prosody. Finally, inarticulate prosody refers to non-linguistic sounds such as sighs, groans or cries that are often used to embellish discourse (Boss, 1996).

## 2. Conceptual overlap and disparity between attitudinal and emotional prosody

More recently, attitudinal or intellectual prosody is often grouped together with emotional prosody under the superordinate term 'affective prosody' (Ross, 2000), but most prior affective prosody research has focussed on emotional prosody (Fichten et al., 1992). One reason for this grouping is that attitudes and emotions are expressed by partially overlapping prosodic elements (Pell, 2006a). Following measurement of the acoustic properties amplitude, pitch and spectral profile for simple emotions such as sadness and more attitudinal states such as relief, discriminant analyses established that these acoustic measures provide sufficient discrimination between expressions to permit accurate statistical classification of both types of prosody (Scott et al., 2010). Of these acoustic properties, the key element that conveys emotional prosody is changes in pitch i.e. fundamental frequency (Bulut and Narayanan, 2008), at least for non-tone languages, such as English (Ross et al., 1986). Research on the acoustic correlates of attitudinal prosody has come to a similar conclusion, showing that fundamental frequency provides artificial neural networks with enough information to correctly discriminate prosodic attitudes with 83% success (Blanc and Dominey, 2003). Elsewhere, there are important differences in the acoustic correlates of emotional vs. attitudinal prosody; prosodic contour is particularly important for the perception of attitudes, whilst voice quality is important for the perception of emotions (Grichkovtsova et al., 2012). However, depending on context, the same prosodic structures can convey either an attitude or an emotion. For example, the rise-fall structure (falling tone with delayed fundamental frequency peak) can either convey the attitude 'impressed' or the emotion 'surprised', depending on the context provided by type of clause and the proposition contained (Cruttenden, 1986). Given that a key way in which advancing our knowledge of attitudinal prosody has been hampered is the inconsistent way in which attitudinal prosody is conceptualised and defined, further work on psychoacoustic overlap may prove fruitful. Whilst getting the scientific community to agree and accept a definitive concept may take some time, a simple way to rule out the possibility that attitudinal prosody and emotional prosody are *not* independent of each other would be to record

actors speaking nonsense words or numbers in designated emotional tones of voice. Two groups of healthy young adults could then listen to these stimuli, one group being instructed to choose the emotion conveyed by intonation. The other group would listen to the intonation of the same stimuli, but would be given a list of attitudes to choose from instead. If there was a large degree of overlap between certain attitudes and emotions (e.g. the emotion disgust and the attitude contemptuous), one may have to conclude that the two are not wholly independent.

At the theoretical level, one way in which (basic) prosodic emotions and attitudes have been distinguished is that 'emotions' are the involuntary expressions of affects, whilst intentionally controlled prosodic expressions are the so-called 'social affect' or 'attitudes' (Aubergé and Gestalt, 2002; Crystal, 1979). According to Scherer, emotions are usually expressed in an intense way in response to a highly significant event, and the identification of emotions is largely universal. In contrast, attitudes are more enduring and concern affectively charged beliefs and predispositions. They are less intense and more socially and culturally controlled than emotions (Scherer, 2003; Scherer et al., 2001). However, the terms attitudinal prosody and emotional prosody are sometimes used interchangeably (Blanc and Dominey, 2003; Schmitt et al., 1997; Tompkins and Mateer, 1985), and it has even been commented that "there is no compelling theoretical base for a distinction between attitudes such as indignation and emotions such as fear" (Mozziconacci, 2001). This confusion may partly result from the problematic definitions of 'attitude' as applied to intonation though, some of which partially conflate the terms 'emotion' and 'attitude'. Indeed, to paraphrase O'Connor 'attitudinal prosody is bedevilled by the lack of agreed categories and terms for dealing with attitudes; they are characterised more with an eye to identifying them to the reader than to classifying them in an orderly scheme, and until some method of dealing with attitudes is developed along very much more scientific lines than is possible at present, we shall not be able to tell whether this language and that are similar or different in the number or nature of attitudes they mark' (O'Connor, 1973). In this review, we attempt to shed light on the linguistic, psychological and neuroanatomical characteristics of attitudinal prosody and suggest that it is deserved of greater recognition and more focussed research in its own right, at least until our understanding of it is on more of a par with emotional prosody.

## 3. How does prosody convey attitudes?

In the previous section, we saw that an important function of prosody is to convey attitudes. Attitudes are a multi-dimensional construct though, and are often vaguely defined (Altmann, 2008). For the purposes of this review, 'attitude' refers to a disposition towards or against a specified phenomenon, person or thing, i.e. the interpersonal stance of the speaker (Pell, 2006a). In the next section attitudes that can be conveyed through prosody are highlighted, before examining how prosodic attitudes are encoded in the acoustic signal and processed in the human brain. Whilst this mode of attitude transmission is not independent of the lexical channel i.e. speech content; (Pell, 2006a), it nevertheless remains a powerful way to transmit attitudes. For example, "that is not the same thing" pronounced with stress and raised pitch on the last word indicates a contradiction; but if the second word is stressed instead, it is more likely to signify an endorsement of what has already been said (Monrad-Kohn, 1963). In certain circumstances, prosodic attitude cues are absolutely vital for a correct understanding of speaker intent. Positive comments spoken in negative tones give subtle clues to speaker attitude not apparent from the words alone, and are only successful if the listener correctly decodes the prosodic

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