

Expression of emotions in spoken Swedish – a corpus study

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Abstract

How are emotions expressed in spoken interaction? Prosodic emotional expressions and emotional words were searched for in the Gothenburg Spoken Language Corpus. Analyses were also made with respect to different activities, e.g. business negotiation, lecture and discussion. Some emotions are expressed with prosody, e.g. surprise, while other emotions are more often expressed with adjectives, e.g. anger and fear. Different emotional expressions are displayed in different social activities. Analyses were also made of prosodic emotional expressions in relation to carrier phrase, showing that the linguistic meaning of some words cannot be determined without the prosody. Preliminary acoustic analyses were made.

Introduction

Communication of emotions is vital in spoken interaction; it is difficult to imagine two, or more, persons interacting face-to-face, or by telephone, without them expressing different emotions almost constantly. The prosodic expression of emotions influences the way we interpret each other's words, in fact it can be claimed that lexical and emotional meaning cannot always be separated, other than analytically: What is the meaning of the Swedish word "nähä"? That cannot be determined without hearing it spoken since the meaning depends on the prosody; if there is an intonation rise on a final stressed syllable (with a long vowel) it means "is that true", with interest or surprise, but if there is stress on the first syllable (with accent II) and falling intonation on both syllables it will mean "no I won't do it" expressing displeasure. Saying that "nähä" is polysemous is to take a written language perspective on word meanings. Some words simply cannot be defined without hearing them spoken.

This paper explores the possibilities of studying emotional expression in the Gothenburg Spoken Language Corpus (GSLC), see Allwood et al (2002). It will mainly treat the use of emotion adjectives and listeners' interpretations of emotional prosody.

The research questions are:

Which emotions do we usually express in communication with each other, with prosody and with words?

How does use of emotional expressions differ in different social activities?

What is the interaction between lexicon and prosody?

The question of the nature of human emotions has been discussed to a great extent (see e.g. Cornelius, 2000, Cuddy & Cornelius, 2003, Scherer, 2003). Speakers use words, prosody, body language or even syntax to express emotions; in this article prosody and words will be studied. Joy, anger, surprise, fear, sadness and disgust have often been described as basic emotions or the big six (cf Ekman, 1992), implying that these emotions are in some way more fundamental than others.

We can express emotions with adjectives: I am happy, angry, sad, afraid, surprised, tired and so on. But often we express the emotions with prosody.

Method

The methods used were the following: Emotional expressions were searched for in Gothenburg Spoken Language Corpus GSLC (www.ling.gu.se/~leifg/tal) with a web based tool, producing e. g. frequencies and concordances. Apart from the transcriptions the corpus contains a rough coding of the interlocutors' different emotional states, as

especially noted by transcribers. (Coding emotions really well is of course a much more complex process, see e. g. Devillers et al, 2005, 2006.) The emotion codings are marked as "mood:" in an information line placed under the transcription. Searches were made with the corpus browser for e.g. "mood:" or "mood: surprised". This was done in order to study emotions expressed with prosody. In order to study emotions expressed with adjectives, words for basic emotions were searched in the transcription line, e.g. "förvånad" (surprised). Analyses were made with respect to different social activities, e.g. "discussion" or "travel agency negotiation" (these are 3 out of 25 social activities in the corpus). Analyses of the relation between words and interpreted mood were made. Finally, preliminary acoustic analyses of some emotional expressions were also made. Since the corpus is not very large, especially when broken down into different activities, the study should be seen as exploratory.

Results

Frequencies of different interpreted emotions

Which emotions are found, in the interpreted mood line, expressed prosodically? In comparison to the number of words in the material, there are rather few instances of different emotions noted by the transcribers. Nevertheless it is interesting to study the ones noted, to see how they are distributed over different emotions, different activities and how they combine with different expressions. There are 566 "mood", of which 235 express the emotions in Table 1. The remaining emotions are distributed over singular occurrences.

Table 1. Frequencies for the emotions marked in the "mood" line. Basic emotions in italics.

Emotion	Frequency
<i>surprised</i>	80
hesitating	56
irritated	35
<i>happy</i>	28
uncertain	18
<i>sad</i>	7
<i>angry</i>	5
amused	6
<i>disgust</i>	0
<i>fear</i>	0

The basic emotions, the big six, are marked in italics in Table 1. There is evidence for four of the six basic emotions, *surprised*, *happy*, *angry* and *sad*. There is also strong evidence for other emotions, *hesitating* and *irritated*. In fact only the basic emotion *surprised* is more common than these two.

Frequencies of emotional adjectives

Looking at the actual transcription we can see which of the basic emotions are expressed with emotion adjectives in the conversations. The reason to choose the basic emotion adjectives is to have a starting point, because emotion words in the transcriptions must be searched by word, not as a group.

Table 2. Emotion adjectives in the transcriptions.

Emotion	Frequency
rädd (afraid)	193
glad (happy)	48
arg (angry)	36
förvånad (surprised)	21
avskyr (detests)	3
ledsen (sad)	2

Comparison of emotions expressed with prosody or with adjectives

Now we can compare the frequencies of mood-coding (prosody) with the frequencies of the adjectives. Anger and fear are not frequent in the mood-coding, i.e. usually not expressed prosodically. But anger and fear are expressed or talked about with words (usually in the past or future tense). Surprise is expressed much more frequently with prosody than with words. Joy is expressed either with words or prosody (or both).

Frequencies of emotional prosody in different social activities

The next question is how common prosodically expressed emotions – "moods", and emotional adjectives are in different activities. Table 3 shows the frequencies for interpreted emotions "moods" in different social activities.

Table 3. Frequencies for prosodically expressed emotions in different social activities.

Travel agency	Lecture	Discussion
happy 13	feigning anger 1	surprised 22
irritated 6	feigning humility 1	sarcastic 12
surprised 6	ironic 1	hesitating 8
uncertain 2	jokingly solemn 1	upset 5
cheerful 2		happy 3
doesn't like 1		accusing 3
upset 1		emphatic 3
amused 1		coldly 2
embarrassed 1		irritated 5
concerned 1		

Table 3 can be summarized in the following way: travel agency dialogues display more *happiness*, lectures show no real emotions, and discussions contain more *surprise*. An explanation for the differences between the activities could be that travel agency interaction is interaction between salesmen and customers which try to show positive emotions and friendliness towards each other in order to sell/buy, the lectures convey no emotions since lectures have an informative function and is mainly one-way communication.

Mood in relation to carrier phrase

The occurrence of different emotional prosody in relation to carrier words was also analyzed. The question is whether emotions are expressed simultaneously in different modalities, e.g. with the words *I am angry*, simultaneously expressed with angry prosody, or whether prosody expresses emotions independently of the lexical content of the words. The findings, in Tables 4 and 5, suggest that prosody can combine with lexical information or be independent of it. Further studies will treat the strength of the prosodic expression in relation to lexical content. (cf. Dubost & Su, 1999, on Mandarin Chinese).

Surprised

The material is quite small if divided into both emotions and social activities, so we will look at all three activities, first at the emotion surprised.

Table 4. Mood: surprised in relation to carrier phrase, in all activities. Utterances occurring more than once are listed.

Utterance	Frequency
jaså (is that so?)	10
jaha (oh well)	6
aha (I see)	2
va (what)	2
nåhå (is that true)	2
nå (is that true)	2
with question word order	17

The most common expressions marked as mood: surprise in all activities is *jaså*, followed by *jaha*. The meaning dimension "unexpected new information" existing in surprise, exists as well in *jaha* (oh well), *oj oj oj* (oh dear). It could exist in *hallå* (hallo) depending on the prosody, again an example of a word which cannot really be semantically defined without its emotional prosody. The meaning dimension of "unexpected new information" in surprise is also found in *jaså* (is that so?), *va* (what), *aha* (I see). It can also be found in *nå* (no) depending on the prosody. The meanings of *nåhå* and *nå* depend on the prosody.

Happy

24 different utterances were marked once as mood: happy. The meaning dimension "positive" exists in many of the words, e.g. in *tack* (thanks) (2) and *bra* (good) (2), *ålskling* (darling) and is not contradictory to the meanings of *hej* (hi) (3), *joo* (yes), *ja* (yes). In some of the words expressed with happiness there is no general positive meaning dimension, like *fishing hat* or *week*.

Irritated and uncertain

The emotions irritated and uncertain were also studied in all activities. 35 utterances were marked as "mood: irritated" The only one occurring more than once is: *ah* (ah!). 10 utterances were marked as "mood: uncertain" The utterances occurring are: *mhm* (feedback), *så dår* (so so), *jaa* (yes), *utveckling* (development), *har jag sagt fel nu* (did I say something wrong now), *hm* ("thinking").

Generally, there is a relation between coded, perceived, emotion and emotional dimension in the lexical items in many cases, but in many other cases not. Examples of a relation are *jaså* (is that so?) with surprise or *bra* (good) with

happiness. Examples of no relation are *fiskemössa* (fishing hat) with happiness or *radion* (the radio) with surprise.

Utterances occurring with different moods

Turning the perspective around, taking the point of departure in which utterances occur for several of these four "moods", we find the following:

Table 5. Utterances occurring for several of the four "moods".

Utterance	Mood
ja (yes)	uncertain, happy
jaa (yes)	uncertain, happy
mhm (yes, feedback)	uncertain, happy, surprised
nä/nej	irritated, surprised

So, some words (feed back words), are to a large extent compatible with different emotional prosodies.

Emotional adjectives occurring in different social activities

The adjectives listed in Table 2 can also be studied in relation to activities. In the three activities travel agency, lecture and discussion, the adjectives studied above: glad (happy), förvånad (surprised), arg (angry) and rädd (afraid) are all common in discussions but almost absent in Travel agency and Lecture. The most common one was *arg* (angry). See Table 6.

Table 6. Adjectives used in three different social activities.

	Travel agency	Lecture	Discussion
glad (happy)	0	0	11
förvånad (surprised)	1	0	9
arg (angry)	0	1	21
rädd (afraid)	0	0	17

There were thus frequency differences of emotion adjectives for different activities: discussions contain many emotion adjectives while travel agency and lecture contain almost none. Compared with Table 3 for emotional prosody in different activities, the biggest

difference is in the activity Travel agency: here emotional expression is conveyed by other means than by adjectives. In lectures there are hardly any emotional expressions, neither with adjectives or prosody and in discussions emotions are expressed with prosody as well as with emotional adjectives.

Preliminary acoustic analyses

Preliminary acoustic analyses were made in order to check the quality of the recordings, which were all made in naturalistic settings. The utterances to be analyzed e.g. *hej*, *ja*, *mhm*, *nej* (cf. Table 5) were found in the GSLC with the help of the corpus browser (searching for word and interpreted mood). Then the transcription and recording numbers were identified and the utterances to be analyzed were copied from the recordings. The recordings were noisy but there were no problem extracting the F0 curves. The F0 of *hej* (*hi*), interpreted as happy, uttered in one travel agency dialogue, is shown in Fig. 1.

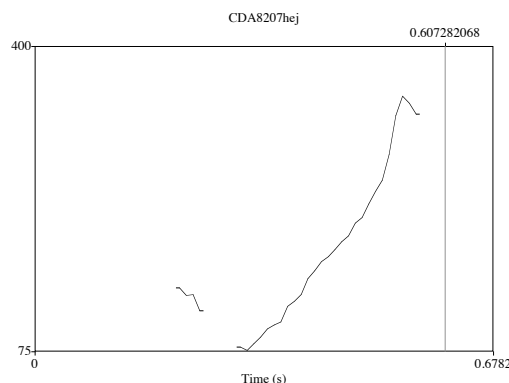


Figure 1: F0 curve of happy *hej* (*hi*).

The F0 curve of *ja* (yes) interpreted as happy, uttered in one travel agency dialogue, is shown below in Fig. 2.

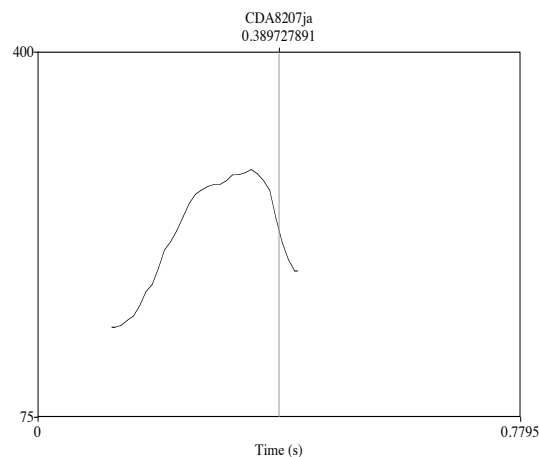


Figure 2: F0 curve of happy *ja* (*yes*).

The diagrams show the (expected) rising F0 curves with good quality. The program used was Praat 5.0.22.

Summary and discussion

The most common emotion expressed by prosody is surprise. Thereafter comes hesitation and irritation. In fourth place we find happiness. Almost no talker expressed fear or real anger, as experience by the interpreters. There were also frequency differences of emotions for different activities: discussions contain more surprise, travel agency dialogues display more happiness and lectures showed no emotions. This could be due to communicative needs and display rules.

The occurrences of adjectives for the basic emotions, the big six, were as follows: rädd (afraid) was most commonly used. Thereafter comes glad (happy), but almost no one uses the word ledsen (sad). There were also frequency differences of emotion adjectives for different activities: discussions contain many emotion adjectives while travel agency and lecture contain almost none. Sometimes lexical and prosodic content seem to interact, sometimes not. Some examples are the following, where the same semantic dimensions can be found in the meaning of the word and the emotion interpreted:

jaså (is that so) – surprised
bra (good) – happy
har jag sagt fel nu (did I say something wrong) – uncertain

But, on the other hand, in the following examples we see no common semantic dimension between the word and the interpreted emotion: fiskemössan (fishing hat) – happy, radion (the radio) – surprised.

Certain utterances are used for many emotions:

utterance	”mood”
ja	uncertain, happy
jaa	uncertain, happy
m(hm)	uncertain, happy, surprised
nä/nej	irritated, surprised

So, some words (feed back words), are to a large extent used with different emotional prosody. Acoustic analyses of the prosody in the recordings is being initiated.

Corpus studies can give us knowledge about:

- Which emotional expressions are used in which situations
- How often they are used
- How we express the emotions – with prosody, words etc.
- How prosody and words interrelate.
- The actual manifestation of emotional prosody in natural spoken interaction

Acknowledgements

The program used for the acoustic analysis was Praat 5.0.22.

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