PSYCHOLOGICAL AND CROSS-CULTURAL EFFECTS ON LAUGHTER SOUND PRODUCTION

Marianna De Benedictis
marianna_de_benedictis@hotmail.com
Università di Bari

1. ABSTRACT

The research within this paper is intended to offer a longitudinal examination of the laugh signal, in order to gain a deeper understanding of how this complex phenomena happens and under which circumstances it can change. So that the main purpose was to identify all the possible sound patterns and elements of a laugh signal, i.e. also those features which are commonly ignored because they are not included among the most well-known *ahahah* sound pattern. Moreover, taking a case study approach, the research tried to question the possible differences existing between "spontaneous" and "intentional", as well as an Italian and a German laugh sound.

2. INTRODUCTION

The non-verbal vocal behaviour to express amusement and mirth can be as different as a laughter and a speech-laugh [1]. Nevertheless it has often been argued that the various ways of expression can change on the basis of the intention of the subjects [2], of their personality and culture [3] [4]. In this study these aspects will be taken into account, giving attention to the complex phonetic structure of the laugh sound as Bachorowski did [5].

2.1. AIMS OF THE STUDY

Starting from the assumption that the sample data was very limited, because the research was meant to be a pilot study, the following purposes were outlined considering the variety of the corpus collected:

a. to identify the possible cultural differences in laughter sounds;
b. to highlight the differences between a spontaneous and an aware laughter, i.e. how a person uses laughter purposely;
c. to analyse all those features of laughing (inspiration, vocalised nasalization) usually not taken into consideration in existing literature.

2.2. TERMINOLOGY

The study of laughter doesn't have a precise terminology, as already Trouvain [13] affirms, but the most common approach is to segment a laugh signal considering it as articulated speech. This can cause some problems because it implies the false assumption that all those aspects not included among the consonant-vowel pattern cannot be classified. So that the terminology, suggested by Bachorowski, revealed to be more suitable to include and to classify the following phonetic aspects:

- laugh call: a rhythmic laugh unit with the vocalic segment as the syllable nucleus preceded by a consonantal segment;
- glottal pulses;
- inhalation: it can be vocalized high pitched and/or characterised by a strong vocalized nasalization.

Aside of these there are also some particular features of laughter which will be examined:

- retained laughter: laughing sounds produced by voluntarily modifying the overflowing sound of the laughter, in the attempt to hide or restrain it. They are different from the "low-pitched chuckle" [5], because of the strong air irruption and often high-pitched vocalization;
- monosyllabic laughter: firstly identified by Edmonson [9]. They are composed by a single laugh call and are called also "comment laugh" [12].

3. DATA RECORDING

A corpus of laugh sounds was collected from three subjects (all female) of two different cultures German and Italian, in two different conditions: spontaneous and aware. The stimulus to elicit the laughter was different according to the spoken language. The spontaneous situation was possible because the two girls (D. and A. – see table 1) had been given the task to listen to the sketch in order to offer their own opinion on the sense of humour

found in the stimulus, the microphone was on while they were listening to the comic sketch with the earphones. In fact they didn't know of being recorded and that the purpose of being invited in the lab was to collect so many laugh signals as possible. The aware situation was due to the fact that the girl (M.) knew the aim of the research, i.e. the recording of laugh sounds. So that it seems reasonable to talk of "non-spontaneous laughter", not because they were forced, but they were not free of the so-called "self-presentation" bonds [6]. In both conditions the microphone was set at 20 cm from the mouth of the subjects.

Unlike other studies, the subjects were not alone in the laboratory, but they were with the author of the research (S.). As the laughter is essentially a social behaviour only using a movie as an solicitator cannot be satisfactory [7] and [8].The experimenter (female) accompanied all the three subjects and she was supposed to interact with them but avoiding to overlap their laughter (as matter of fact her voice remains in the background of the recordings). Nevertheless her laugh and speech production were slightly audible in the recording and will allow some consideration and comparison.

Table 1 – Laughter sample pool

	D.	A.	M.	S.
time of recording	3 min. 15 sec.	5 min. 45 sec.	5 min. 45 sec.	9min.
n ° laughs	15	9	14	4

The recordings were than digitalized with the software WASP and segmented into smaller pieces lasting less than 3 seconds.
Within this sample pool all the isolated laugh sounds and speech-laughs were saved separately.

Table 2 – Subject recorded

	D	A	M	S
age	23	26	36	26
culture	German	Italian	Italian	Italian
situation	unaware	unaware	aware	aware

4. THE RESULTS

Although generally there is a great concordance with other studies, it was possible to analyse exceptions, or "uncommon" phenomena, the investigation of which can contribute to the understanding of the laughter in its complex and articulated nature. Consequently it is necessary to detach from those studies which try to limit it in its most stereotyped and common aspects (*ah ah ah* sound). It was recognized that Provine's limitation to stereotypical involuntary laughter covers the domain inadequately and that across natural languages the orthography for representing stereotypical laughter in the written mode is not the same as has been already mentioned by Trouvain [13].

The most relevant aspects found were as follows:

- retained laughter
- monosyllabic laughter

The *retained* laughter is a very important example of voluntary modification of laughing, in the attempt to hide the audible laugh expression. Although Backorowski noted that there are also low-pitched laugh signals, it is important not to confuse those ones with the retained laughter, whose features were already described by Darwin [10]:

- a strong inhalation obstructs the normal expiratory process of laughter (circled in fig. 1 and 2).
- the closure of the mouth prevents the sound exiting, so that the air exits through the nose producing a strong audible nasal expiration.
- control of the movement of the glottis, emitting very short pulses of low intensity.

In the following examples (figure 1 and 2) one can notice the complete irregularity of the laugh signal, in contrast with the well-known rhythmic sequence of laugh calls with the typical aspiration phase. Here it is clear the effort of both subjects to control the otherwise bondless emission of vocalization.

Figure 1 – Example of retained laughter in S.

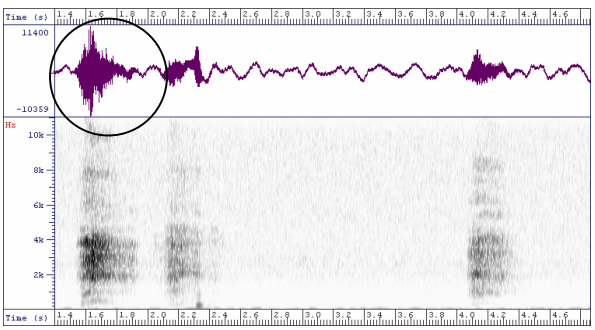
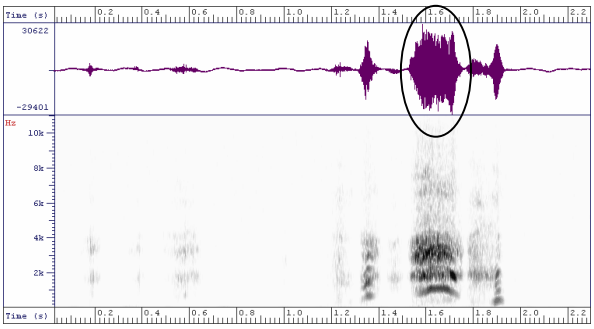


Figure 2 – Example of retained laughter in A.



Unfortunately this kind of laughter could be only identified with the perception of the experimenter, because there were no video recordings, so that no clear visual cues were available (covering the mouth with hand, avoiding eye contact with social partner).

The *monosyllabic* laughter was considered as composed of a single laugh call sandwiched with silence (2 sec.) and without overlapping acoustic events. The examination of this kind of laugh emission revealed that the laugh sound produced by a person is very similar both in long laugh episodes and monosyllabic ones. As a matter of fact, comparing the spectrum of a laugh call of a long laughter with that of a monosyllabic interesting similarities were visible (see figure 3 and 4, a monosyllabic and a laugh episode of subject A.). So one can hypothesize that, apart from the number of laugh syllables emitted, the movement of the glottis within the subject remains more or less the same. Subject A. and D. emitted this kind of monosyllabic laughter, or comment laugh, while the subject M. didn't. Probably the difference can be explained with the fact that this latter was aware, so that she supposed that the kind of laughter needed were those song-like and acoustically well identifiable, instead of small expiration or movement of the glottis.

Fig. 5 presents an example of monosyllabic laughter in subject D., while figure 6 gives an example of a longer laugh produced by the same subject. Comparing the laugh syllable in fig. 5 and fig. 6, one can clearly see that the sound produced during a monosyllabic laughter is similar to the one of the laugh bout. In both cases it is evident that the glottal movement is mainly of complete closure, instead of aspiration (as it was the case of the subject A.)

Figure 3 – Example of mono-syllabic laughter in A.

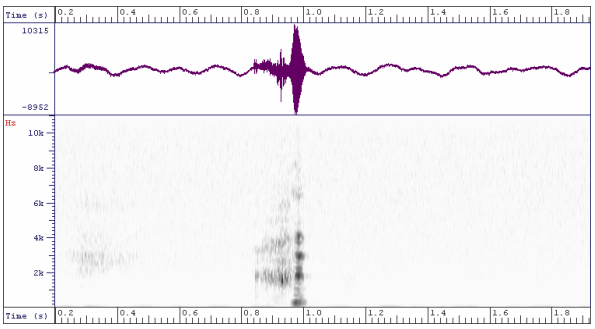
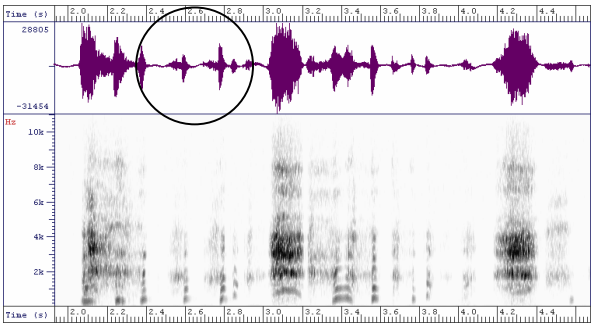


Figure 4 – Example of laugh episode in A.



Moreover, one can argue that the monosyllabic laughter in subject D. (fig. 5) is completely different from the one produced by subject A. (fig. 3), in which an aspiration phase precedes the vocalic emission. On the contrary here it is a strong glottal pulse.

Figure 5 – Example of monosyllabic laughter in D.

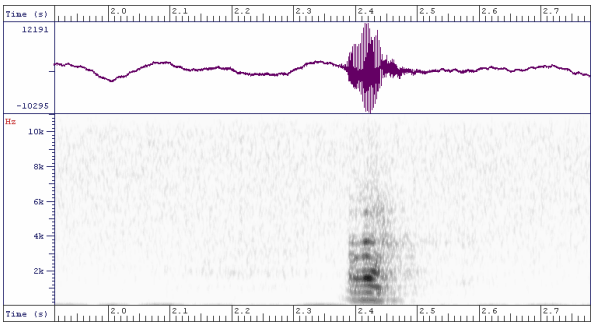
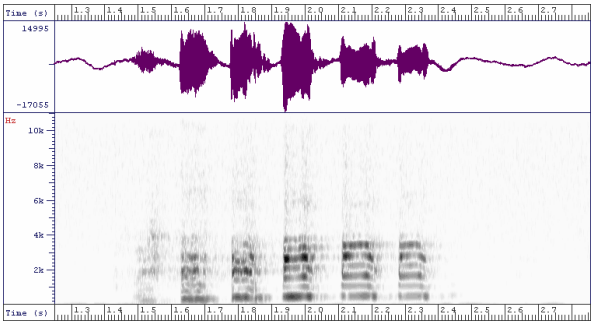
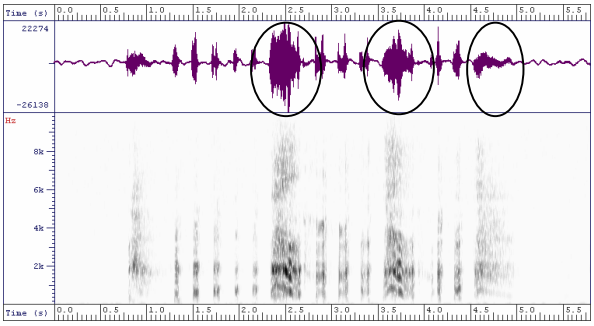


Figure 6 – Example of laugh bout in D.



Aside of this aspect, it can be considered how the laugh call is not composed necessarily by an aspiration phase followed by a vocalic segment, but just of a vocalic segment started with a sudden opening of the glottis.
Another aspect is the different use of the *vocalised inhalation* between the spontaneous and intentional laughter. The German subject made a rare use of this, compared with the two Italian subjects. But the subject M. made a greater use of them compared to A., most probably because it is easier to inhale letting the vocal cords vibrate than to emit the typical vocalised high-pitched sound of laughter, i.e. exhale as strong as the laughter emission is. Indeed it has been pointed out that the laughter expiration happens at a very low lung volume in which involuntary muscles movements are activated. So that it can be roughly assumed that the intention of producing loud laughing sounds was achieved thanks to the vocalized inhalation, which allowed the emission of vocalised *ahahah* pattern sounds. For example in the following figure it is possible to notice even three vocalized inhalation (circled in fig. 7).

Figure 7 – Example of laugh episode in M. with many vocalized inspirations



Furthermore, aside from all the consideration another interesting element was found, i.e. what Darwin [10] already pointed out. A laughing sound can be frequently confused with a crying one, especially was the case of those laughter rich in inhalation and pauses (file *laughter crying.wav*) can be confused with the sound produced when sobbing. Nevertheless, also in this case there isn't a relevant evaluation and evidence but the perception of the experimenter. Of course it would be required the realization of a perceptual test.

5. CONCLUSIONS

Given these results it can be noticed how the study of laughter needs a very complex way of analysis because there are many aspects to be considered. Consequently the one-dimensional approach which takes into account only the stereotypical sound of laughter [11] should be avoided, and the segmental portion should be extended to a variety of other phenomena like vocalized inhalation, nasal sounds and glottal pulses.

It was revealed that the use of a vocalized inhalation can help the subject to communicate being amused more easily, because the production of very strong audible laugh sound requires a particular lung effort, which is possible only in real spontaneous laughter. But a listener's evaluation of the degree of enjoyment or amusement in the laugh sounds with and without vocalized inhalation would be necessary.
The retention of laughter itself can be done by closing the mouth and controlling the vocal cords so that the emission of sound is reduced to short strong glottal pulses. It was found that a laughter does not necessarily start with an exhalation phase but also with a strong vocalized inspiration because of the contrasting force applied to invert the normal ongoing of the expression.
Relevant cross-cultural differences were not found except the rare use of vocalized inhalation within the German subject (D.). On the contrary they were very common in both the aware and unaware Italian subjects (A. M.). However, the sample size was much too small to draw any conclusions about such differences. So that any differences are found among these participants, it is impossible to know if these are merely the sorts of inter-individual differences found between any individuals within culture, or if they are due to the differences nationality and "awareness".

REFERENCES

[1] Trouvain, J. 2001. Phonetic aspects of speech-laughs, in *Proceedings Conference on Orality and Gestuality (Orage)*, Aix-en-Provence, 634-639

[2] Grammer, K. 1990. Strangers meet: laughter and non-verbal signs of interest in opposite encounters, *Journal of Nonverbal Behaviour 14*, 209-236

[3] Eibl-Eibesfeldt, Ir. 1974. Somiglianze e differenze interculturali tra movimenti espressivi In: Robert A. Hinde (ed), *La comunicazione non-verbale*. introd. of Tullio De Mauro, translation of R. Simone, Roma, Bari: 395-418

[4] Rothgaenger, H.; Hauser, G.; Cappellini, A.C. Guidotti, A. 1998. Analysis of laughter and speech sounds in Italian and German students, *Naturwissenschaft 85*, 394-402
[5] Bachorowski, J.A., Smoski, M. J., Owren M.J. 2001. The acoustic features of human laughter, *Journal of the Acoustical Society of America 110 (3)*, 1581-1597
[6] Scherer, K. 1986. Vocal affect expression: a review and a model for future research, *Psychological bulletin, vol. 99 (2)*, 143-165
[7] Martin, R. A. and Kuiper, N.A. 1999. Daily occurrence of laughter: relationships with age, gender and type A personality, *Humor, 12 (4)*, 355-384
[8] Provine, R. 2000. *Laughter: A Scientific Investigation.* London: Faber & Faber
[9] Edmonson, M., 1987. Notes on laughter, *Anthropological linguistics, 29 (1)*, 23-34
[10] Darwin, Ch. 1872. *The Expression of Emotions in Man and Animals*. London: Murray, (3rd ed. Paul Ekman, New York: Oxford Univ. Press, 1998) chapt. 8, 195-218
[11] Provine, R.; Yong, Y.L. 1991. Laughter a stereotyped human vocalization, *Ethology, 89 (115)*, 115-124
[12] Nwokah, E.E., Davies, P., Islam, A. Hsu, HC. & Fogel, A. 1993. Vocal effect in 3-year-olds – A quantitative acoustic analysis of child laughter. *Journal of the Acoustical Society of America*, 94 (6), pp. 3076-3090
[13] Trouvain, J. 2003. Segmenting Phonetic Units in Laughter. 15th ICPhS Barcelona.