

EMOTIONAL FACIAL EXPRESSIONS IN INDIVIDUALS WITH TOTAL LARYNGECTOMY

Expressões faciais emocionais em indivíduos laringectomizados totais

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ABSTRACT

Purpose: to verify whether there are differences in the degree of intelligibility of individuals with total laryngectomy, using different forms of oral communication (speech whispered, electronic larynx, esophageal voice and tracheoesophageal speech); verify whether there are differences in facial expression (number and duration of facial movements) in total laryngectomized individuals using different forms of oral communication during spontaneous happy and sad speeches and verify if there are differences in facial expression (number and duration of facial movements) of individuals with high and low intelligibility of spontaneous happy and sad speeches. **Methods:** treated an exploratory, descriptive and comparative basic methodology cross, and constituted a group of thirteen individuals with total laryngectomy. Subjects were videotaped during both spontaneous happy and sad speeches and evaluated for speech intelligibility for people without pathology of communication, and facial expression analysis was performed using the Facial Action Coding System. We used Statistical Package for the Social Sciences 19 for descriptive and inferential analysis, and held the *Mann-Whitney* and Kruskal-Wallis statistical tests. **Results:** we found that different types of communication have varying degrees of intelligibility in speech and descriptively differences in facial expression of laryngectomized subjects during the two different type of speeches used in this study. We also verified statistically significant differences in facial expression in groups of low and high intelligibility, the average duration of each unit of sad eyes in spontaneous speech (p-value=0.01). **Conclusion:** it was found that the two emotional contexts, the laryngectomy, regardless of their communicative way, are less facially expressive than normal falantes.

KEYWORDS: Emotions; Facial Expression; Laryngectomy; Speech Intelligibility

■ INTRODUCTION

Cancer has an impact increasingly emergent in societies once it is one of the most feared diseases and it provokes many strong emotions not only in patient, but also in those who surround him/her.¹

In Portugal larynx cancer corresponds to twenty-five per cent of the malignant tumours in head and neck region¹ and it could compromise larynx functions, such as breathing, deglutition and phonation, and, thereafter, communication. It is most frequent in men between fifth and sixth decade of life and its etiology is strongly related to smoking,

alcohol, professional exposition to metals, textiles and radiations, and also hereditary factors.²

The location and staging of the tumor are proxies in delineating the treatment and, in most cases, the option is surgical, total or partial laryngectomy associated or not with radiotherapy and/or with chemotherapy, in pre or post surgery.

After a total laryngectomy, the breathing becomes to be held definitively by tracheal stoma and the production of laryngeal voice becomes impossible³.

Some authors relate that a total laryngectomy is emotionally more traumatic than another type of surgery due to psychological and functional impairment⁴. The initial aim is the rehabilitation of the oral communication of the individual, thus allowing a social, professional and a family reintegration of the laryngectomized person^{3,5}. The return

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of communication becomes the triad's priority: laryngectomized, phonoaudiologist and physician. However, the prognosis of vocal rehabilitation varies from person to person according to anatomical and physiological, psychological and social factors. Classically, in Portugal, the vocal reeducation may start by using remaining anatomical segments (esophageal voice), prosthesis (electronic larynxes) or prosthetic-surgical devices (tracheoesophageal fistulas).

The voice plays a fundamental role in communication as it permits the transmission of our ideas, desires and emotions. On the other hand, it is known that the voices acquire an affective value and to listen to them is enough to influence our perception and interaction with people⁶. Thus, intelligibility is seen as the capacity to use phonetic units of speech, so that the speaker can be well understood by the listener in different situations of communication².

The human face is a rich source of information where one can infer about the different characteristics of the individuals, such as, age or sex. The emotional expression, being the most important channel, plays an important role in social communication⁷. Emotions can, therefore, be linked either to vocal acoustic parameters or to facial expressions. The facial expressions of emotion are modeled by the movements of the muscles of the face that correspond internally to affective states⁸ and it is the most basic and common form to express emotions. They are also the most rich and important way in interpersonal relations to express the states of mind, the emotions, the desire to communicate and the level of expressiveness during communication, through the changes in the configuration of the eyes, mouth and the position of eyebrows.

Despite some aspects of expressions are culturally determined there are basic expressions that are universally recognized, such as happiness, sadness, aversion, surprise, fear, and anger⁹.

Several studies have been carried out in the context of facial expressions in some pathologies, in its great majority in neurological and psychiatric population. Patients with depression showed incapacity to accurately identify several emotional expressions, which lead to changes in interpersonal relations¹⁰. In addition to the previously mentioned, they tended to judge neutral emotions (as surprise) as being more negative and they are less facially expressive than healthy individuals. In this context, the studies also indicate a decline in the competence of facial expression of emotions as they become older, as well as a decrease of the intensity of these same emotions¹². In short, do not be able to transmit a nonverbal message adequate to the verbal content or to the emotion desired can be of

great concern and a source of bad understanding¹³. Towards the previously exposed, it will be expected that the laryngectomized person presents not only a difficulty in expressing ideas and concepts, but also in expressing emotions.

After the bibliographic review, it was found that there is a lack of studies on the capacity of transmitting emotions in the population of laryngectomized patients. In Portugal, as far as we could ascertain up to the present, there is only one study on the spontaneous emotional facial expression with the same methodological approach, referring to the vocal pathology¹⁴.

The present study aimed: (1) to describe the emotion perceived and its intensity in spontaneous speech emotionally positive and negative of normospeakers and laryngectomized people; (2) to describe the level of intelligibility in several alternatives to laryngeal voice in the group of laryngectomized; (3) to check if there are statistically significant differences in the level of intelligibility of several alternatives of communication from laryngectomized person; (4) to describe the facial expression (the number and duration of movements) in neutral, happy and sad contexts of normospeakers and laryngectomized during the task of automatic language; (5) to describe the facial expression (the number and duration of movements) in normospeakers and laryngectomized during *happy* and *sad* spontaneous speeches; (6) to verify the existence of differences statistically significant in facial expression of happiness and sadness during the *happy* and *sad* spontaneous speech in normospeakers and laryngectomized; (7) to describe the transmission of happiness and sadness (the number and duration of movements) in normospeakers and laryngectomized during *happy* and *sad* spontaneous speech; (8) to describe and verify the existence of statistically significant differences between the facial expression of *happiness* and *sadness* in laryngectomized patients of low and high intelligibility during *happy* and *sad* spontaneous speech.

■ METHODS

It was an exploratory, comparative study, with a descriptive basis and a cross-sectional methodology. The research sample was comprised of all laryngectomized people available in the Otorhinolaryngology Service of the Hospital Garcia de Orta, between February and July of 2011, who met the inclusion criteria: male, total laryngectomy for at least six months, without depressive symptoms, without changes of the orofacial mobility and without neurological pathology. The present study was approved

by the Committee for Ethics in research with human beings of the Hospital Garcia de Orta, with the number 21922. For comparative purposes, it was

constituted a homogenous group of normospeakers collected in our circle of knowledge, fairly balanced as to age.

Table1 – Sociodemographic characteristics of the sample groups

		Normospeakers N=13	Laryngectomized N=13
Age	Mean±SD [Min-Max]	62,08±8,89 [51-83]	64,31±10,55 [51-86]
Qualifications	Without qualifications	0%	7,7%
	Firstcycle	7,7%	7,7%
	Secondcycle	38,5%	53,8%
	Thirdcycle	23,1%	23,1%
	Secondary	7,7%	0%
	Graduation	23,1%	0%
	Master'sdegree	0%	7,7%
Civil status	Married	100%	84,6%
	Single	0%	0%
	Widower	0%	7,7%
	Divorced	0%	7,7%
Professional situation	Worker	46,2%	15,4%
	Retired/Unemployed	53,8%	84,6%
Household	Alone	0%	15,4%
	Wife	46,2%	38,5%
	Wifeandchildren	53,8%	30,8%
	Wife, childrenandgrandson	0%	7,7%
	Mother	0%	7,7%

SD – standarddeviation; Min – Minimum; Max – Maximum

The sample was, then, composed of thirteen total laryngectomized men (two with electronic larynx, three with whispered speech, four with acquired esophageal voice through the method of injection of air, or Dutch method, and four with tracheoesophageal voice), with an average age of 64.31±10.55 years old and thirteen normospeakers men with an average age of 62.08±8.89 years old (Table 1). Although the group of normospeakers is younger, both groups did not show significant differences regarding the dependent variable age ($p= 0.56$). The classification of the level of intelligibility, performed by thirty people, of both sexes, collected within our circle of knowledge, without contact or hearing training prior to the pathology (laypeople), has determined the existence of eight laryngectomized people with low intelligibility with an average of five years of surgery and five with high speech intelligibility with an average of three years of surgery (Table 2).

The instruments used for data recording were the sociodemographic characteristics record sheet of the sample and the qualifying and quantifying emotional record sheet. On the emotional qualification record sheet the six basic emotions universally recognized are present; this sheet was drawn up with the aim of understanding whether the emotion examined by the authors is in agreement with the emotion perceived by the individual. Nevertheless, the record of emotional quantification relating intensity (emotional quantification) was carried out by a visual analogue scale (VAS). This scale is graphically represented by a vertical line of 100mm, which contains, in the extremes, zero and ten, which correspond to the emotion "Null" and "Extreme", respectively. In this vertical line the individual was instructed to register the amount of emotion experienced at the time.

Table 2 – Characterization of group laryngectomized in low and high intelligibility

		Low intelligibility	High intelligibility
N		8	5
Age	Mean±SD	67,88±11,84	58,60±4,72
	[Min-Máx]	[56-86]	[51-62]
Time surgery	Mean±SD	5,38±6,55	2,80±0,84
	[Mín-Máx]	[1-19]	[2-4]

SD – standard deviation; Min – Minimum; Max – Maximum

Procedures

All participants were informed about the study and authorized its participation by informed and enlightened consent. After the ethical procedures, the screening of depressive states through the Portuguese version of the Scale of Depressive States (CDS-D)¹⁵ was carried out. All individuals with answers above 16 values were eliminated.

Subsequently, the record of the connectors of sociodemographic characterization of the sample was carried out and also video and audio recording in two tasks: automatic language (neutral emotional context) and *happy* and *sad* spontaneous speech. Image collection was performed by Sony HD digital camera, throughout a fixed distance of one meter. Video and audio collection was accomplished in the phonoaudiologist cabinet, in calm and quiet environment.

The induction of emotion happy was given by verbal stimulus “Imagine that I would say to you that you were the unique Euromillions winner. Please, describe me your next week” and the emotion sad through the stimulus “Imagine that I would say to you that your cancer has returned. Please, describe me your next week”, for the laryngectomized group and “Imagine that I would tell you that you had a larynx cancer. Please, describe me your next week” for normopeakers group. The choice of the positive stimulus was performed based on its usage in a previous study¹⁴ with dysphonic population and which proved to be inducer of happiness in perceiving of the studied population. The choice of the inducing stimulus of sadness was performed because it was identified by laryngectomized population as the health condition with greater impact on their quality of life^{4,13} and also because the cancer is one of clinical situations most feared by the population. The order of emotions requested was at random, and it was requested before and after the task of spontaneous speech to individuals who appoint the months of the year (automatic language). After each spontaneous speech it was also asked to individuals to qualify and quantify the emotion felt.

In the videos analysis, to prevent contamination of the facial analysis, video files were visualized at random order and without sound. The analysis of the videos was made by Anvil 5.0¹⁶ program, and the annotations were about movements of minimum units of movement, belonging to the Coding System of Facial Action (FACS)¹⁷. It was also decided that, with basis on the Portuguese study, referring the vocal pathology¹⁴, the units of action concerning *happiness* were, for the eyes, the A6, and, for the mouth, the A12, A13 and A14; and for the *sadness*, for the eyes, the A7, A41, A42, A43 and A44, and, for the mouth, the A10, A11, A15, A16 and A20.

Finally, in order to check the type of communication with better level of intelligibility, it was asked to thirty individuals (men and women), collected in our circle of knowledge, without connection or hearing training prior to the pathology (laypeople), with ages between twenty-seven and eighty-three years, to evaluate the level of intelligibility of the communication of the laryngectomized by audio and video visualization (in order to approach as much as possible to the context of social interaction) of the first 30 seconds of happy and sad spontaneous speech and it was requested them to refer what they understood from the recording, and to quantify from zero to ten the level of understanding, as zero corresponded to “nothing” and 10 to “everything”. For the images viewing it was used a TOSHIBA *Satellite* A200-12X computer and for images hearing it was used Apple Headphones. The answers of individuals were recorded with *Olympus* digital VN-7800 PC Dictaphone. After this quantification of intelligibility, one proceeded to a cut-off point of five to group the individuals by low and high intelligibility.

Data were processed using SPSS 19, using Shapiro-Wilk test to check the existence of normality, and Mann-Whitney test and Kruskal-Wallis test for the comparison between independent groups. It was used for inferential analysis the level of significance of $\alpha = 0.05$.

■ RESULTS

The results will be presented in the order of proposed objectives.

Quantification and emotional qualification

We can see in Table 3 that, in both groups, the emotional intensity perceived is positive. Laryngectomized with electronic larynx were those who felt happiness (8.75 ± 1.77) and sadness (7.50 ± 3.54) with greater intensity in relation to laryngectomized with esophageal voice (7.50 ± 2.74) that are also the group with the greatest intensity of sadness. Both normospeakers and laryngectomized realized the positive emotions in a more intense way than the negative. This finding is justified in studies carried out in this area¹⁸, due to the fact that happiness is a marginal emotion because it is the only one that involves an excitability/generalized

activation before the tendency for action, while all the other emotions are defined in terms of readiness to take specific actions. These findings do not meet the results by the group with electronic larynx once they quantified the excitement in *happy* spontaneous speech with high values, but they were not the most expressive in all facial segments. On the other hand, the group with electronic larynx and esophageal voice quantified the emotion, in *sad* spontaneous speech, with a high intensity, compared to other groups. However, these groups weren't also the ones who presented more movements associated with the expression of sadness, which goes against the findings of another study¹⁸, in which the author mentions that the relation between the duration and the intensity felt in general is low or even negative and the relationship is caused by external stimulus that also influences the emotional duration.

Table 3 – Emotional quantification for different types of communication in the evocation

Emotional quantification	Types of communication				
	Normospeakers	WS	EL	EV	TV
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Happiness	7,59±2,70	6,33±3,18	8,75±1,77	7,13±1,89	6,60±4,32
Sadness	6,72±2,81	6,00±1,80	7,50±3,54	7,50±2,74	6,33±2,45

SD – standard deviation; WS – Whispered Speech; EL – Electronic Larynx; EV – Esophageal Voice; TV – Tracheoesophageal Voice

Most subjects identified the positive emotions perceived as happy, as expected. From the positive emotion, we only obtained a response of surprise, which fact is justifiable by the attitude/initial response to given news and not with the perceived emotion after the news. In the negative context, it was found several qualifications, in which the identification of surprise and aversion were more frequent. This fact was interpreted by the same reasons of happiness plus, in negative context, the internal emotional self-regulation in response to the stimulus is often distorted by denying a hypothetical situation. These findings agree with the results of another study¹⁸, in which it was found that the sensation of the body, in a given state, represents the individual consciousness of self-focus, which means that the experienced emotion awareness is not objective and as the emotional transmission is innate, this can lead to the individual cannot be aware of it and cannot actually refer the emotion he transmitted. Nonetheless, scientific evidence emphasizes that not healthy individuals are able to identify and facially transmit their emotional states

and this is a likeable fact for their social interaction¹⁰, while some pathological groups, such as depressive population, cannot do it¹¹.

Intelligibility in different types of oral communication

As we can see in Table 4, only the communication by electronic larynx and tracheoesophageal prosthesis are perceived with a positive intelligibility, a fact that may be related with the characteristics of quality and audibility inherent to them, which corroborates with other studies, once the authors refer that these individuals have a functional speech and with high intelligibility^{2,19} despite the flattened prosodic characteristics characterizing the electronic larynx mentioned by some authors. On the other hand, the group with esophageal voice was one of the groups that presented worse intelligibility, and such inference will also meet the results of a study once performed². Regarding the group with whispered speech, no studies were found that describe the intelligibility of these individuals; however, based on what was said by individuals

during the that classification, it appears that some people have said that “they don’t hear any sound and they only saw mouth movements”; such facts are corroborated by two authors, when they define this type of communication as the absence of any sound vibration and the surrounding air can only be modulated by articulators and, therefore, it is barely audible/understandable²⁰.

By *Kruskall-Wallis test* it was found the existence of differences in intelligibility statistically significant among various communicative forms ($p \leq 0.05$). *Mann-Whitney test* allowed us to verify that the aforementioned differences are between whispered speech and tracheoesophageal voice ($p = 0.03$) and the esophageal voice and the tracheoesophageal voice ($p = 0.02$), in both tracheoesophageal voice evidences a significantly superior intelligibility.

Table 4 – Speech intelligibility in different types of oral communication

	Types of communication			
	WS	EL	EV	TV
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Speech intelligibility	3,12 ±0,66	6,75±2,76	2,95±1,02	8,44±1,23

SD – standard deviation; WS – Whispered Speech EL – Electronic Larynx; EV – Esophageal Voice; TV – Tracheoesophageal Voice

Automatic Language

In the task of automatic language we can check in table 5 that in neutral context normospeakers are facially less expressive compared to laryngectomized individuals, once they just presented facial activity at the level of their eyebrows, while

laryngectomized also presented movements at the level of the mouth, although restricted, which agrees with the results of a study where the author mentions that these facial segments are not or are slightly activated in non emotional contexts²¹.

Table 5 – Facial expression in normospeakers and laryngectomized during the task of automatic language

	Normospeakers			Laryngectomized		
	Neutral	Happiness	Sadness	Neutral	Happiness	Sadness
	M±SD	M±SD	M±SD	M±SD	M±SD	M±SD
Number of eye movements		1,00±0,00	1,00±0,00		1,00±0,00	
Total duration of eye movements (sec)		0,16±0,04	0,15±0,00		0,08±0,06	
Average duration of each unit eyes (sec)		4,56±2,42	0,41±0,00		2,62±0,74	
Number of movements of the mouth		1,00±0,00	1,00±0,00	1,00±0,00	1,00±0,00	
Total duration of mouth movements (sec)		0,19±0,00	0,14±0,00	0,05±0,00	0,06±0,01	
Average duration of each unit mouth (sec)		0,86±0,00	1,03±0,00	0,05±0,00	0,81±0,66	
Number of movements of the eyebrows	1,00±0,00	1,00±0,00	1,00±0,00	2,00±2,00	2,00±2,00	2,00±1,41
Total duration of eyebrows movements (sec)	0,12±0,03	0,12±0,06	0,10±0,01	0,15±0,14	0,11±0,13	0,13±0,10
Average duration of each unit eyebrows (sec)	1,97±1,22	2,97±2,63	3,50±3,54	3,81±2,42	2,98±2,96	2,26±2,50

M – Mean SD – standard deviation

In *happy* and *sad* emotional contexts, one can verify that normospeakers present only a few more movements and with greater total and unitary duration in most facial segments, and also, more units of action associated with the expression of happy; this fact can be justified with some findings in which some authors of the study refer that, after the access to emotions of evocation, the feeling endures more, what it can be translated into longer facial movements to keep the expression produced active and which translates a greater emotional intensity during the procedure²². In the sad context there aren't actions of mouth and eyes movements by laryngectomized, which can be related to the fact that the evocation in these subjects is a reality already experienced and assume autobiographical characteristics²³ that lead them to be more apathic, by a psychological mechanism of compensation^{5,24}.

The fact that in these three contexts normospeakers and laryngectomized support the speaking in eyebrows segment, leads to the findings of several authors²⁵, where it was found that the upper part of the face transmits more emotional information and that, during the various emotional contexts, is approximately 120% more active than in *neutral* context.

Happy spontaneous speech

In Figure 1, we can verify the activation of all facial segments in both groups, as we verify that the eyes are the facial segment less active in both groups, being a fact corroborated in several studies²⁵, where the authors refer that the role the eyes play is to intensify the main role of the mouth during the transmission of emotions of happiness and sadness. We can also verify the presence of few units of action activated by individuals, and the only one which is associated with happiness and which is activated by them meets the facts where it was found that for the characterization of the expression of the emotion of happiness, one of the movements is the elevation of the cheeks (A6)²⁶. Among all the facial segments which were analyzed, the mouth is the most active segment in both groups, being slightly higher in laryngectomized. These results can be justified with the fact that the lower part of the face contains higher levels of effective action and is related to speech production, once the articulatory processes play a crucial role in the movement of the face²⁵. Despite the previously mentioned, we didn't find statistically significant differences between both groups ($p \geq 0.05$).

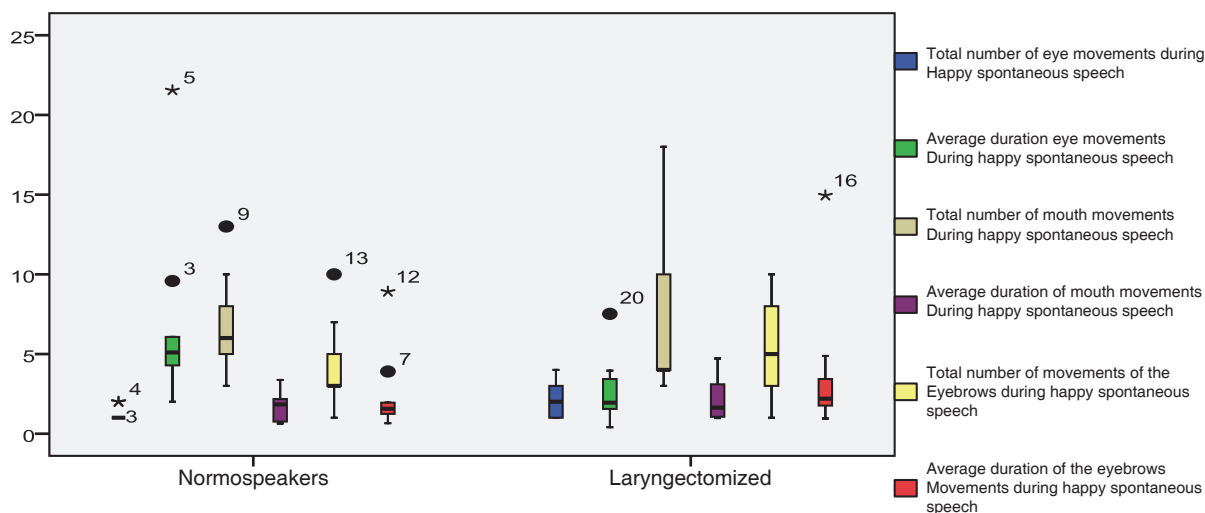


Figure 1 – Facial expression of happiness in normospeakers and laryngectomized during *happy* spontaneous speech

Sad spontaneous speech

Finally, regarding *sad* spontaneous speech (figure 2), we can verify that the eyes are the facial segment that presents the smallest number and duration of movements, which coincides with the results of *happy* spontaneous speech and meets, once again, several studies²⁵. However, these authors report that the eyes do not carry emotions of sadness or happiness, but only intensify the expression given by the mouth and such fact is not

corroborated by the findings of the present study, once we realized the presence of units of simple and complex action associated with both emotions. We also found in this spontaneous speech that the mouth is the facial segment more active and slightly higher in laryngectomized, and this fact was also observed in population with vocal pathology¹⁴.

However, no statistically significant differences were found between both groups ($p \geq 0.05$).

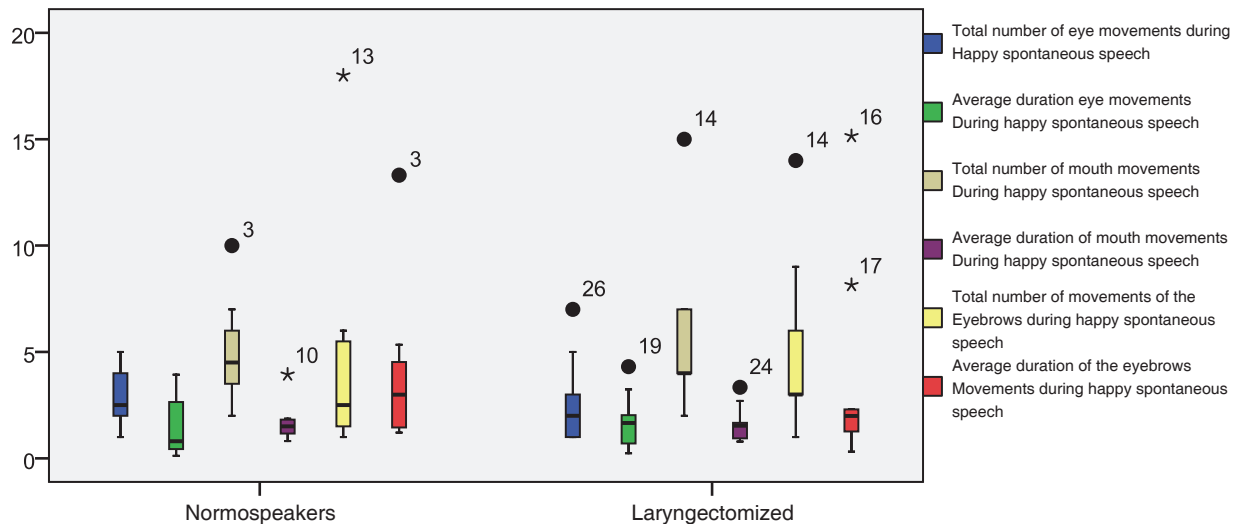


Figure 2 – Facial expression of sadness in normospeakers and laryngectomized during sad spontaneous speech

Transmission of happiness and sadness

From the observed units and those which refer to the emotion of happiness (Figure 3), in *happysp* spontaneous speech, these ones will meet several findings²⁶, once the pulled corners of the mouth (A12) were observed, by both groups, but only in combined movements. At this level, were realized the presence of more movements and with greater temporal support associated with happiness by normospeakers, which may highlight the idea advocated by several authors when they say that laryngectomized, as they showed a change in communication, represent difficulties in expression of thoughts, feelings and/or emotions. On one hand, at the level of the eyes, were realized the presence of more movements but with less temporal support, by laryngectomized, which indicates that, in these individuals, the upper part of the face intensifies the emotional expressivity and the speaking. On the other hand, the units present at the level of the mouth, in *sad* spontaneous speech, exist in a greater number and they are more complex compared to *happysp* spontaneous speech; however,

their presence leads to several autores²⁶ when they mention that the characteristics of the expression of sadness comprise the mouth half-opened (A25) with elevation of the upper lip (A10), corners of the mouth in tension (A12) and facing down (A15). The fact that we found the presence of units of action concerning happiness in this spontaneous speech by both groups, but in a greater number by laryngectomized, raises the hypothesis that these individuals exhibit more strategies of coping with the intention of reducing the emotional disorder generated by emotional content, keeping the hope and optimism and denying both the situation and consequences²⁷. Comparing the facial expression in both emotional contexts we can verify that normospeakers are, thus, more expressive facially, which indicates that this difficulty by laryngectomized can be related to the fact that they are slightly older; there is a decline in the expression of emotions because of the increasing age, and these emotions are less frequent and less intense¹²; This fact leads to the conception defended by another autor².

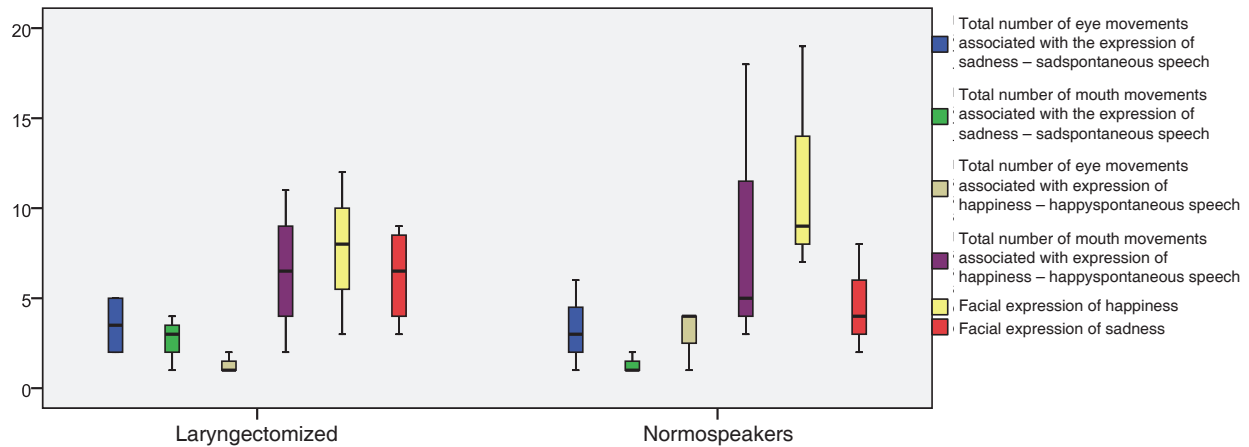


Figure 3 – Transmission of happiness and sadness in normo speakers and laryngectomized during happy and sad spontaneous speech

According to face behavior of total laryngectomized individuals that present different types of oral communication, in *happy* spontaneous speech we can verify that the group with electronic larynx presents a greater number of movements at the level of the eyes and mouth, as compared with the other types of oral communication; these results can be supported with the importance of the non-verbal resources in communication for the complementation of what is said orally by these individuals¹⁹. This complementation of non-verbal resources, this type of oral communication, may also justify the fact that these individuals have a higher number of units of action, at the level of the eyes, associated with happiness, i.e. once the aim of *happy* spontaneous speech was to direct the speech and the behavior of the face for the expression of happiness, these individuals needed to use more resources and, in turn, to activate more movements that transmit this emotion. However, the fact that these individuals present less movements associated with happiness, at the level of the mouth, can be

justified by the fact that their voice is partially modeled and amplified by an electronic device¹⁹ and, therefore, it leads to the individual does not make full usage of all their articulators to produce voice and full decrease the activity of this segment. On the other hand, we can verify that individuals who use tracheoesophageal voice communication presented, at the level of the mouth, long movements and activated more codes associated with the expression of happiness in this segment, being this fact supported by previous studies, where it was found that these individuals have achieved a functional speech and of good quality, which leads to a less difficulty in express themselves¹⁹.

Concerning *sad* spontaneous speech, we can verify a great variability of results in the various types of oral communication whereby at the level of the eyes, it was found that the group with tracheoesophageal voice presented more and longer movements being these findings substantiated by other studies¹⁹. The good functionality of the speech acquired by these individuals is also related

to the fact that we have observed in them more codes associated with the expression of sadness, in this spontaneous speech, because this facility in expressing themselves leads to that the same individuals, after the access to the emotions of the spontaneous speech, would be able to lengthen the feeling, by the analyzed segments²². At the level of the mouth we can verify that the group with whispered speech presents the largest and longer number of movements, as these results may be related to the fact the whispered speech is only modulated by articulators, through the exploitation of the circulating air within the resonance spaces¹⁹ and they require a more and a larger temporal support of the movements of this segment to communicate. We could also verify that this group was more expressive through the mouth in order to express happiness, in this spontaneous speech, which can be related to the production of voice by the absence of sound vibration, and, inherently, leads to the fact that these individuals present more strategies of coping, which increases optimism²⁷, positively expressed by mouth.

Facial expression in laryngectomized with low and high intelligibility

Analyzing the behavior of the face in the groups with low and high intelligibility (Table 6), we can verify that the same did not present statistically significant differences in facial expression in both evocations ($p \geq 0.05$), except in the average duration of each unit of the eyes in the *sad* spontaneous speech (p -value= 0.01), and the group with low intelligibility presented significantly more durable movements. This fact can be justified by the role the eyes play, which is to intensify the main role the mouth plays in the transmission of emotions of happiness and *sad*²⁵, which leads to the fact that, in this spontaneous speech, the activated units have had a great variability in terms of temporal support, while they helped other segments. Nevertheless, this finding may also highlight the role the eyes plays in the transmission of sadness, which fact is confirmed in another study¹⁴, and that in the absence of oral competence, by low intelligibility, it becomes more active in assisting the desired transmission of emotional message.

Table 6 – Comparison of facial expression in the groups of low and high intelligibility during happy and sad spontaneous speech

	Happiness			Sad		
	Low intellig.	High intellig.	p-value	Low intellig.	High intellig.	p-value
	Mean Rank	Mean Rank		Mean Rank	Mean Rank	
Number of eye movements	4,92	5,17	0,893	4,92	6,38	0,43
Total duration of eye movements (sec)	4,33	6,33	0,291	5,08	6,13	0,59
Average duration of each unit eyes (sec)	6,17	2,67	0,071	7,33	2,75	0,01
Number of movements of the mouth	7,56	6,10	0,504	5,38	8,75	0,12
Total duration of mouth movements (sec)	6,44	7,90	0,508	6,19	7,13	0,67
Average duration of each unit mouth (sec)	7,13	6,80	0,884	5,38	8,75	0,12
Number of movements of the eyebrows	6,94	5,63	0,548	7,94	5,50	0,25
Total duration of eyebrows movements (sec)	5,88	7,75	0,394	7,81	5,70	0,34
Average duration of each unit eyebrows (sec)	6,13	7,25	0,610	7,88	5,60	0,30

Statistical test: Mann-Whitney ($p \leq 0,05$)

Concerning the observed units of action that refers to the expression of happiness, the group with low intelligibility presented more complex movements, greater in number at the level of the mouth movements and longer, either for the eyes, or for the mouth, which can be related with the time of operation, since this group presents a greater average time of surgery, and then refuting the idea that, when he/she passes the minimum time after the operation (six months), the individual thus increases the ability to accept himself/herself in the society, increasing their social relations, transmission of emotions and improve communicative act²³. To these facts one can also associate the increase of strategies of coping, as they show a greater adaptability to situations they are exposed daily²⁷; the increase of these strategies also justifies the presence of codes associated with the expression of happiness in spontaneous speech sad. On the other hand, we could verify that the group with high intelligibility presented more movements associated with the expression of sadness, and these results can be corroborated with the idea that improving the functionality of speech the individual is more capable to communicate and make a full usage of all the communication skills (verbal and non-verbal) daily². In This way, in addition to the rehabilitation of oral communication, it is important to promote the facial expressiveness in postoperative period to make the process of adaptation to the new condition easier⁵.

On the other hand, the same groups did not present statistically significant differences in emotional demonstration of happiness and sadness ($p \geq 0.05$). These findings meet the results in depressive population¹¹ or even, in population with vocal pathology¹⁴, and in the area of schizophrenia²⁸, once in these studies there were differences in emotional demonstration in one or in both emotions. Taking into account that there are no differences in emotional demonstration, data do not corroborate the study, where the author¹³ mentions that the expression of emotions can be altered in populations which exhibit unique changes of the physical structures, once the ability to express emotional states can be interrupted or even lost because of a deficiency underlying a physiological or neurological subsystem. The absence of changes at this level also leads to the small impact of communication in the transmission of emotions and to the lasting quality of life. These abilities are also likely to play an important role in our daily social interactions and to promote success in events such as job interviews, personal relationships and social position²⁹.

■ FINAL COMMENTS

We founded that laryngectomized, regardless their communicative way, are less facially expressive than normospeakers, which translates a non-usage of their non-verbal communicative potential as an aid to oral communication which could lead to a compromise in the transmission of emotions and inherently of family life, social and affective.

One can understand that, in spite of all the consequent changes, the surgery and the possibility to continue, or even, to establish new plans, predominated over the perceptions of any losses and obstacles with which the individuals were confronted with. It would be expected that laryngectomized, by presenting a change in oral communication, optimized the emotional transmission by the face, once this transmission is bimodal, and such a fact was not verified; however, these results should not be generalized, once the sample is small and should not be ruled out the idea that this area of intervention should be assessed and studied, by encouraging these individuals to make usage of all non-verbal potentials, promoting a more effectively communicative act in interpersonal relations.

Since this is an exploratory study and also by the lack of studies conducted with the same methodology, it has become difficult to carry out the discussion of the results, and this is one of the limitations of this study. Another limitation was the time of completion of the study and the time required for the analysis of facial expression that it doesn't made possible to obtain a sample with a significant number, for further generalizations. The fact that we need to record the individuals and they don't feel comfortable with a video camera and, consequently, the fact that there isn't a therapeutic relationship with the researcher, leads to the condition that they are not totally in a natural environment, which can then compromise the faithful transmission of emotions during the application of the methodology of the study. Despite these limitations, the problematic questions initially placed were answered and the goals achieved.

We can, therefore, walk in the direction of improving the communicative resources, in order to seek a more natural speech and decrease the strange feeling by the listener. In this perspective, the expressiveness should be worked to benefit the communication and future studies should be conducted in this area, in order to help in the rehabilitation of these patients and to better understand the impact that verbal communication disrupted by laryngectomy has in non-verbal communication, presenting more effective therapeutic approaches in rehabilitation of the communication of these

individuals. It is then proposed that future studies should be performed in women, because there is a certain prevalence of this pathology in these individuals and we do not know if there are differences among them. Finally, to avoid some methodological errors, it is proposed that in future studies, the recording of the tasks is not held in the same days and that the tasks of spontaneous speech are not requested by the researcher of the study, in order to avoid the surprise factor in individuals, not compromising the self-perception of the emotions and obtaining a greater time of speaking to further analysis of the emotional facial expression.

■ CONCLUSION

According to emotional quantification, laryngectomized patients with electronic larynx were those who felt happiness and sadness with greater intensity, and those who used esophageal voice showed higher intensity of sadness. Either normospeakers or laryngectomized perceived the positive emotion in a more intense way than the negative.

On the other hand, according to the emotional qualification, the majority of individuals identified the positive emotion as happiness, but, in negative context, the identification of the surprise and aversion were more frequent.

Communication through electronic larynx and tracheoesophageal prosthesis showed good intelligibility, but esophageal voice and whispered speech showed worse intelligibility. Tracheoesophageal voice showed a significantly higher intelligibility.

In automatic language, it was found that in neutral context normospeakers are less facially expressive compared to laryngectomized, but in emotional context *happiness and sad*, we could found that normospeakers presented more and lasting movements, and also more units of action associated with the expression of happiness.

During *happy and sad* spontaneous speech, there were differences in descriptive facial expression in both groups, however no statistically significant differences were found between them.

In both emotional contexts it was found that normospeakers are more facially expressive.

There were no statistically significant differences in facial expression in both evocations between the groups of low and high intelligibility, excepting the average duration of each unit of eyes in *sad* spontaneous speech; the same groups did not show statistically significant differences in emotional demonstration of happiness and sadness.

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RESUMO

Objetivos: verificar se existem diferenças no grau de inteligibilidade de indivíduos laringectomizados totais, que utilizam diferentes formas de comunicação oral (fala murmurada, laringe eletrônica, voz esofágica e voz traqueoesofágica); verificar se existem diferenças na expressão facial (número e duração de movimentos faciais) de indivíduos laringectomizados totais, que utilizam diferentes formas de comunicação oral, durante tarefas de discurso espontâneo *alegre* e *triste* e, ainda, verificar se existem diferenças estatisticamente significantes na expressão facial (número e duração de movimentos faciais) de indivíduos com elevada e baixa inteligibilidade durante tarefas de discurso espontâneo *alegre* e *triste*. **Métodos:** tratou-se de um estudo exploratório, comparativo de base descritiva e de metodologia transversal, sendo que se constituiu um grupo de treze indivíduos laringectomizados totais. Os indivíduos foram filmados durante as duas tarefas de discurso espontâneo *alegre* e *triste* e avaliados quanto à inteligibilidade do discurso por pessoas sem patologia da comunicação, sendo que a análise da expressão facial foi realizada com recurso ao Sistema de Codificação de Ação Facial. A análise descritiva e inferencial foi efetuada com recurso ao SPSS19 por meio da aplicação dos testes Mann-Whitney e Kruskal-Wallis. **Resultados:** verificou-se que os diferentes tipos de comunicação apresentam diferentes graus de inteligibilidade no discurso e que descritivamente existem diferenças na expressão facial dos indivíduos laringectomizados totais durante o discurso espontâneo *alegre* e *triste*. Verifica-se ainda diferenças estatisticamente significantes na expressão facial nos grupos de baixa e elevada inteligibilidade, na duração média de cada unidade dos olhos no discurso espontâneo *triste* (p -valor=0,01). **Conclusão:** verificou-se que nos dois contextos emocionais, os laringectomizados, independentemente da sua forma comunicativa, são menos expressivos facialmente do que os normofalantes.

DESCRIPTORIOS: Emoções; Expressão facial; Laringectomia; Inteligibilidade da fala

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