

THE ANALYSIS OF ERRORS IN FACIAL EXPRESSIONS RECOGNITION BASED ON DANVA 2

ADRIAN ROȘAN

ABSTRACT. Recognizing facial expressions for basic emotions such as joy, sadness, fear and anger represents an essential element for successful interpersonal relationships. This four types of human emotions are most frequently used in everyday communication and should be achieved until the age of 10. Without these abilities, the awareness of the right way to behave in social situations would be relatively useless and furthermore, learning how to process more complex types of emotions such as guilt or shame would be very difficult or even impossible. This study aims to highlight a method of analyzing the errors that occur in recognizing facial expressions on the base of an internationally validated instrument that we adapted on a sample of adolescents aged 13 to 18. We consider this a first step in our process of intervention for the optimization of emotional competence and implicitly, of communication and interpersonal relationships.

Keywords: *recognizing facial emotions; emotional competence, social competence, adolescents, interpersonal relationship*

ABSTRAKT. Die Erkennung der typischen faziablen Ausdrücke für die Freudegegensbewegungen die Traurigkeitengemuts bewegungen, Angstgemutsbewegung und Wutgemutsbewegung ist ein wichtiges Element im Erfolg der interpersonalen Beziehungen. Diese vier Gemuts bewegungen sind oft in der taglichen Interaktionen getroffen und man vermutet das diese bis 10 Jahre lernen sollten.

Ohne diese Geschicklichkeiten wäre das Bewusstsein der richtigen Weise des Benehmens in der sozialen Situationen unnützlich. Das Lernen wie man die schwierigen Gemütsbewegungen wie das Schuldsein oder die Scham prozessiert wäre es schwierig oder unmöglich. In diesem Studium unterstreichen wir eine Analyseweise der Fehlgriffe in der Erkennung der faziablen Ausdrücke mit der tiefe einem bestätigten International Apparat. Dieses Apparat wurde bei uns auf einem Jugendlichenmuster (zwischen 13 - 18 Jahre) bearbeitet.

Eine solche Analyse bedeutet die erste Etape einer Intervention bezüglich der Optimisierung der emotionellen Fähigkeit und einbegriffen der Verbindung und der interpersonalen Verbindungen.

Stichwörter: *Erkennung von Gesichtsausdrücken, emotionale Kompetenz, soziale Kompetenz, Adoleszenten, zwischenmenschliche Beziehungen*

Recognizing facial expressions and the correct use of facial index represents a key factor in the process of communication along with the interpersonal relationships. This requires certain training at early age that will later be materialized in what we call emotional competence. The errors committed in identifying facial expressions have a negative influence on interhuman communication and on the development of empathy in different social contexts, which may lead to disruptive behaviour.

A first step in the assessment of emotional competence resides in the level of accuracy in identifying facial expressions, materialized in the number of errors that occur in the recognition of facial index for the main emotions such as joy, sadness, fear and anger.

We propose for this the use of DANVA 2 which represents a complex diagnosis analysis of the accuracy of non verbal receptivity.

Data concerning the receptive and expressive subtests of the original DANVA 2 Screening Instrument were presented for the first time in 1989 within a symposium of the APA and the published in the Journal of Nonverbal Behavior (1994).

DANVA 2 is used for identifying:

- the number of errors committed for each type of emotions;
- the number of errors concerning high or low intensity stimuli;
- the number of errors for each type of emotions regarding the intensity of the stimuli;

Data analysis

We have standardized and adapted this instrument on a Romanian sample of 228 adolescents, aged 13 to 18, the average age of 15,8 years old. The sample consisted of 29,8% boys and 70,2% girls.

Table no. 1

| AGE | | |
|------------------------|---------|--------|
| N | Valid | 228 |
| | Missing | 0 |
| Mean | | 15,88 |
| Std. Deviation | | 1,39 |
| Skewness | | ,074 |
| Std. Error of Skewness | | ,161 |
| Kurtosis | | -1,254 |
| Std. Error of Kurtosis | | ,321 |

Table no. 2

| AGE | | Frequency | Percent | Valid Percent | Cumulative Percent |
|------------|-------|-----------|---------|---------------|--------------------|
| Valid | 13 | 1 | ,4 | ,4 | ,4 |
| | 14 | 45 | 19,7 | 19,7 | 20,2 |
| | 15 | 57 | 25,0 | 25,0 | 45,2 |
| | 16 | 37 | 16,2 | 16,2 | 61,4 |
| | 17 | 53 | 23,2 | 23,2 | 84,6 |
| | 18 | 35 | 15,4 | 15,4 | 100,0 |
| | Total | 228 | 100,0 | 100,0 | |

Table no. 3

| GENDER | | |
|------------------------|---------|--------|
| N | Valid | 228 |
| | Missing | 0 |
| Mean | | 1,70 |
| Std. Deviation | | ,46 |
| Skewness | | -,888 |
| Std. Error of Skewness | | ,161 |
| Kurtosis | | -1,223 |
| Std. Error of Kurtosis | | ,321 |

Table no. 4

| GENDER | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------------|----------|-----------|---------|---------------|--------------------|
| Valid | masculin | 68 | 29,8 | 29,8 | 29,8 |
| | feminin | 160 | 70,2 | 70,2 | 100,0 |
| | Total | 228 | 100,0 | 100,0 | |

The internal consistency index of 0,85 indicates a good construct validity of the instrument on the investigated sample.

Table no. 5

| RELIABILITY ANALYSIS - SCALE (ALPHA) | | | | |
|---|---------|-----------------|---------|-----------|
| N of | | | | |
| Statistics for | Mean | Variance | Std Dev | Variables |
| SCALE | 49,7105 | 248,4268 | 15,7616 | 51 |
| Reliability Coefficients | | | | |
| N of Cases = 228,0 | | N of Items = 51 | | |
| Alpha = ,8509 | | | | |

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For a better understanding of the assessment measures that this instrument uses to determine the accuracy of nonverbal receptivity we present an example below.

An example of error analysis for facial expressions recognition¹

Client: **Berciu Radu**

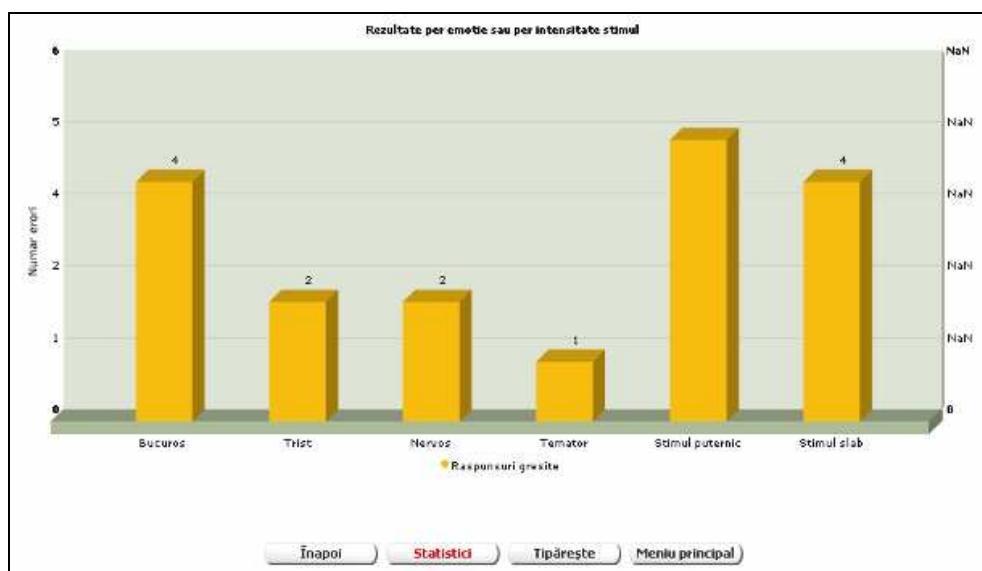
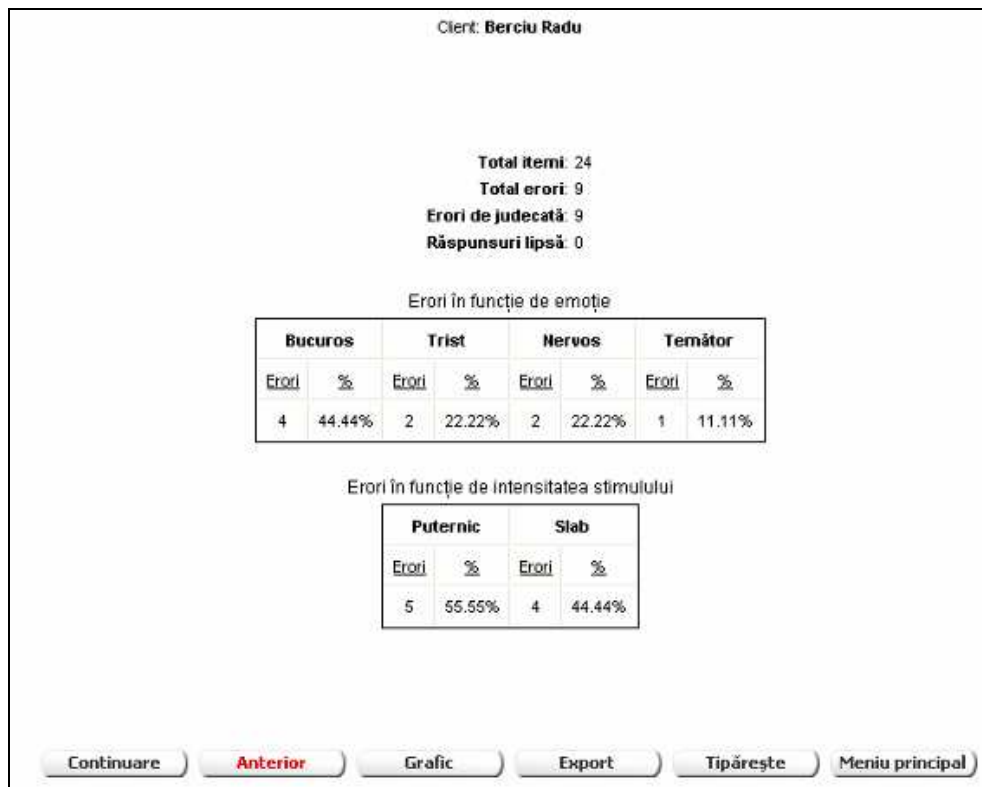
| Listă itemi | | | | |
|-------------|----------------|----------------|-------------|---|
| Item | Răspuns client | Răspuns corect | Intensitate | |
| 1 | bucuros | bucuros | ridicată | ✓ |
| 2 | trist | temător | scăzută | ✗ |
| 3 | bucuros | nervos | ridicată | ✗ |
| 4 | temător | bucuros | scăzută | ✗ |
| 5 | nervos | nervos | scăzută | ✓ |
| 6 | trist | trist | ridicată | ✓ |
| 7 | bucuros | bucuros | scăzută | ✓ |
| 8 | temător | temător | scăzută | ✓ |
| 9 | trist | temător | ridicată | ✗ |
| 10 | bucuros | bucuros | scăzută | ✓ |
| 11 | nervos | trist | ridicată | ✗ |
| 12 | bucuros | nervos | scăzută | ✗ |
| 13 | trist | trist | scăzută | ✓ |
| 14 | trist | trist | scăzută | ✓ |
| 15 | bucuros | nervos | ridicată | ✗ |
| 16 | temător | temător | scăzută | ✓ |
| 17 | nervos | trist | scăzută | ✗ |
| 18 | trist | trist | ridicată | ✓ |
| 19 | temător | temător | ridicată | ✓ |
| 20 | bucuros | nervos | ridicată | ✗ |
| 21 | temător | temător | ridicată | ✓ |
| 22 | nervos | nervos | ridicată | ✓ |
| 23 | bucuros | bucuros | ridicată | ✓ |
| 24 | bucuros | bucuros | ridicată | ✓ |

Răspunsuri corecte: 62.5%

Statistici Grafic Export Tipărește Meniu principal

¹ The name of client is fictive
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1. The average of total errors using DANVA 2 (adult figures)

Table no. 6

| | | |
|------|---------|------|
| N | Valid | 228 |
| | Missing | 0 |
| Mean | | 8,29 |

The average of total errors registered on the sample of 228 participants at the study is 8,29.

By reporting the average we have obtained to the average of 4,2 for the segment of age between 13 and 18 on the basis of over 200 other studies, we have noted that the average of total errors on the Romanian sample is double, which may require further investigation.

2. The average of errors committed for each of the four types of emotions that were evaluated: joy, sadness, fear and anger

Table no. 7

| | | E_BUCURO | E_TRIST | E_NERVOS | E_TEMATO |
|------|---------|----------|---------|----------|----------|
| N | Valid | 228 | 228 | 228 | 228 |
| | Missing | 0 | 0 | 0 | 0 |
| Mean | | 2,01 | 1,99 | 1,83 | 2,45 |

Data analysis shows an average of total errors for the emotion of joy of 2,01, for the emotion of sadness of 1,99, for the emotion of anger of 1,83 and for the emotion of fear of 2,45. Therefore, our findings indicate that the lowest value for the average of errors is registered for the emotion of anger and the highest for the emotion of fear. The values of the averages of the other two types of emotions were close. We note that the most serious difficulties in nonverbal accuracy recognition were found for the emotions of anger, joy and fear.

3. Total number of errors in recognizing emotions regarding the intensity of the stimulus

Table no. 8

| | | E_PUTERN | E_SLAB |
|------|---------|----------|--------|
| N | Valid | 228 | 228 |
| | Missing | 0 | 0 |
| Mean | | 4,89 | 3,39 |

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We found an average of errors depending on the intensity of the stimulus of 4,89 for the strong stimuli and of 3,39 for the weaker stimuli. Therefore, the average of total errors in recognizing facial expressions is higher for stronger stimuli.

Table no. 9

| | | E_SLAB | | | | | | | | | | Total | |
|----------|-------|--------|----|----|----|----|----|----|----|---|---|-------|----|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | 10 |
| E_PUTERN | 1 | | 1 | | 2 | | | | | | | | 3 |
| | 2 | | 1 | 3 | 3 | 2 | 2 | | | | | | 11 |
| | 3 | | 2 | 2 | 6 | 3 | 2 | | | 1 | | | 16 |
| | 4 | 2 | 13 | 8 | 19 | 11 | 4 | 3 | 2 | 1 | | 1 | 64 |
| | 5 | | 8 | 13 | 21 | 12 | 9 | 1 | 1 | | | | 65 |
| | 6 | | 5 | 7 | 9 | 8 | 3 | 3 | | | 1 | 1 | 37 |
| | 7 | | 1 | 1 | 7 | 5 | 3 | 2 | 1 | 1 | | | 21 |
| | 8 | | | | 1 | | 2 | | 2 | 3 | | | 8 |
| | 9 | | | | | 2 | | | | | | | 2 |
| | 11 | | | | | | | | | 1 | | | 1 |
| | Total | | 2 | 31 | 35 | 67 | 45 | 23 | 11 | 7 | 4 | 1 | 2 |

Table no. 10

Chi-Square Test

| | Value | df | Asymp. Sig. (2-sided) |
|------------------------------|------------|----|-----------------------|
| Pearson Chi-Square | 147,922(a) | 90 | ,000 |
| Likelihood Ratio | 82,621 | 90 | ,697 |
| Linear-by-Linear Association | 14,000 | 1 | ,000 |
| N of Valid Cases | 228 | | |

By applying CHI square test , we found significant differences between the values of errors depending on intensity of the stimulus, showing that the number of errors is higher for the stimuli of higher intensity than for those of lower intensity.

4. The average of total errors for the emotion of joy depending on the intensity of the stimulus

Table no. 11

| | | E_BUC_P | E_BUC_S |
|------|---------|---------|---------|
| N | Valid | 228 | 228 |
| | Missing | 0 | 0 |
| Mean | | 1,81 | 0,20 |

We found an average of total errors for the emotion of joy of 1,81 for the high intensity stimuli and of 0,20 for the low intensity stimuli.

Table no. 12

| | E_BUC_S | | | | Total |
|-----------|---------|----|---|---|-------|
| | 0 | 1 | 2 | 3 | |
| E_BUC_P 0 | 29 | 3 | 1 | | 33 |
| 1 | 53 | 3 | | | 56 |
| 2 | 55 | 9 | 4 | | 68 |
| 3 | 53 | 8 | 3 | | 64 |
| 4 | 3 | 2 | | 1 | 6 |
| 5 | | 1 | | | 1 |
| Total | 193 | 26 | 8 | 1 | 228 |

Table no. 13

Chi-Square Test

| | Value | df | Asymp. Sig. (2-sided) |
|------------------------------|-----------|----|-----------------------|
| Pearson Chi-Square | 54,747(a) | 15 | ,000 |
| Likelihood Ratio | 23,253 | 15 | ,079 |
| Linear-by-Linear Association | 7,133 | 1 | ,008 |
| N of Valid Cases | 228 | | |

CHI square test showed significant differences between the values of errors for the emotion of joy depending on the intensity of the stimuli, thus the number of errors is higher for the high intensity stimuli than for the low intensity stimuli.

5. The average of total errors for the emotion of sadness regarding the intensity of the stimulus

Table no. 14

| | | E_TRI_P | E_TRI_S |
|------|---------|---------|---------|
| N | Valid | 228 | 228 |
| | Missing | 0 | 0 |
| Mean | | ,71 | 1,28 |

We found an average of total errors for the emotion of sadness of 0,71 for the high intensity stimuli and of 1,28 for low intensity stimuli.

Table no. 15

| | | E_TRI_S | | | | | | Total | |
|---------|-------|---------|----|-----|----|----|---|-------|-----|
| | | 0 | 1 | 2 | 3 | 4 | 5 | | 6 |
| E_TRI_P | 0 | 26 | 55 | 25 | 8 | 2 | | | 116 |
| | 1 | 13 | 34 | 21 | 4 | 2 | | | 74 |
| | 2 | 4 | 13 | 10 | 1 | 1 | 1 | | 30 |
| | 3 | 2 | 2 | 1 | | | | 1 | 6 |
| | 4 | | 1 | | | | | | 1 |
| | 6 | | | | 1 | | | | 1 |
| | Total | | 45 | 105 | 57 | 14 | 5 | 1 | 1 |

Table no. 16

Chi-Square Test

| | Value | df | Asymp. Sig. (2-sided) |
|------------------------------|-----------|----|-----------------------|
| Pearson Chi-Square | 65,458(a) | 30 | ,000 |
| Likelihood Ratio | 24,352 | 30 | ,756 |
| Linear-by-Linear Association | 5,061 | 1 | ,024 |
| N of Valid Cases | 228 | | |

CHI square test showed significant differences between the number of errors committed for the emotion of sadness depending on the intensity of the stimulus, thus the number of errors was higher for the low intensity stimuli and lower for the high intensity stimuli.

6. The average of total errors for the emotion of anger regarding the intensity of the stimulus

Table no. 17

| | | E_NER_P | E_NER_S |
|------|---------|---------|---------|
| N | Valid | 228 | 228 |
| | Missing | 0 | 0 |
| Mean | | 1,23 | ,61 |

We found an average of total errors committed for the emotion of anger of 1,23 for the high intensity stimuli and of 0,61 for the low intensity stimuli.

Table no. 18

| | | E_NER_S | | | | | Total |
|---------|---|---------|----|----|---|---|-------|
| | | 0 | 1 | 2 | 3 | 4 | |
| E_NER_P | 0 | 35 | 11 | 7 | 2 | 1 | 56 |
| | 1 | 55 | 28 | 9 | 4 | 2 | 98 |
| | 2 | 29 | 16 | | | | 45 |
| | 3 | 10 | 11 | 2 | 1 | | 24 |
| | 4 | 3 | 1 | 1 | | | 5 |
| Total | | 132 | 67 | 19 | 7 | 3 | 228 |

Table no. 19

Chi-Square Test

| | Value | df | Asymp. Sig. (2-sided) |
|------------------------------|-----------|----|-----------------------|
| Pearson Chi-Square | 15,740(a) | 16 | ,471 |
| Likelihood Ratio | 21,499 | 16 | ,160 |
| Linear-by-Linear Association | ,173 | 1 | ,677 |
| N of Valid Cases | 228 | | |

CHI square test showed no significant differences between the number of errors for the emotion of anger depending on the intensity of the stimuli, though the average of errors was higher for the high intensity stimuli than for the low intensity stimuli.

7. The average of total errors for the emotion of fear regarding the intensity of the stimuli

Table no. 20

| | | E_TEM_P | E_TEM_S |
|------|---------|---------|---------|
| N | Valid | 228 | 228 |
| | Missing | 0 | 0 |
| Mean | | 1,14 | 1,31 |

We found an average of total errors committed for the emotion of fear of 1,14 for the high intensity stimuli and of 1,31 for the low intensity stimuli.

Table no. 21

| | E_TEM_S | | | | | Total |
|-----------|---------|-----|----|----|---|-------|
| | 0 | 1 | 2 | 3 | 4 | |
| E_TEM_P 0 | 15 | 37 | 11 | 6 | | 69 |
| 1 | 16 | 42 | 22 | 5 | 7 | 92 |
| 2 | 5 | 20 | 11 | 4 | 1 | 41 |
| 3 | 9 | 3 | 9 | 1 | | 22 |
| 4 | | | 1 | | | 1 |
| 5 | | | | 1 | | 1 |
| 6 | | 1 | | | 1 | 2 |
| Total | 45 | 103 | 54 | 17 | 9 | 228 |

Table no. 22

Chi-Square Tests

| | Value | df | Asymp. Sig. (2-sided) |
|------------------------------|---------------------|----|-----------------------|
| Pearson Chi-Square | 52,854 ^a | 24 | ,001 |
| Likelihood Ratio | 42,325 | 24 | ,012 |
| Linear-by-Linear Association | 3,114 | 1 | ,078 |
| N of Valid Cases | 228 | | |

CHI square test showed significant differences between the number of errors for the emotion of fear depending on the intensity of the stimulus, the average of total errors being higher for the low intensity stimuli and lower for the high intensity stimuli.

Conclusions

The average we found for the number of errors in recognizing facial expressions was of 8,29, which represents a double value regarding the average found at transcultural level. We consider that this finding is of major importance and we suggest further investigation in what concerns emotional competence within Romanian samples.

In what concerns the hierarchy of errors within the four types of emotions, we have found consistent difficulties for the emotion of fear, than for the emotion of joy, followed by the emotion of sadness and last, for the emotion of anger. Therefore, we found that, within the Romanian sample we investigated, there were serious difficulties in recognizing typical facial expressions for the emotions of fear and joy, which can have a possible impact on the adolescents' behavior and on their level of satisfaction.

The analysis of errors regarding the intensity of the stimuli (high or low) points out that for the emotion of joy, the number of errors is significantly higher for the high intensity stimuli than for the low intensity ones. Moreover, significant differences were found for the emotions of sadness and fear depending on the intensity of the stimulus, the number of errors being higher for the low intensity stimuli than for the high intensity ones.

The profiles of the registered errors allow us to rapidly identify the difficulties participants face in different social or personal contexts, which can be useful in our intervention programme. Including low intensity stimuli within the test was a major objective, concerning the fact that daily social interactions require accuracy in identifying emotional messages of low intensity. These four types of emotions are frequently used in everyday interactions and should be achieved until the age of 10 (Camras & Allison, 1985; Curtrini & Feldman, 1989; Kirouac & Dore, 1983). Without this set of abilities, the awareness of the right way to behave in social situations would be relatively useless and furthermore, learning how to process more complex types of emotions such as guilt or shame would be very difficult or even impossible.

Taking into account that the average we found on the Romanian sample for the number of errors committed in recognizing facial expressions was double that the given average found in various transcultural studies and also that the high values were registered for both low or high intensity stimuli, we recommend further research in what concerns the assessment of emotional competence on Romanian samples. We believe that to be of major importance, regarding also the fact that our curriculum includes extremely poor educational offers concerning the development of emotional competence.

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