Intervention of the Prosocial Cognitive Model on Emotional Intelligence in Adolescents: A Multidisciplinary Study

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Introduction

Adolescence is a time when emotional regulation seems to be compromised resulting in impulsive-type behaviors that make them unfit for cognitive problem solving. The social environment close to the adolescent shapes the development of cognitive skills associated with social competence. School adaptation problems, of academic and social nature, are a very important factor, as school is a very close context of coexistence for young people.

Research Question/Hypothesis: The main objective of our study was focused on the detection of differences in social and emotional skills in adolescents according to the presence or absence of school adaptation problems.

The study was approached from a multiple perspective, from the psychosocial and neuropsychological levels, using various validated questionnaires and neuropsychological tests to assess cognitive skills, as well as the analysis of brain activity of electroencephalographic type. The comparative study was carried out among a group of adolescents who presented school adaptation problems of a social-academic type versus a non-equivalent control group. The analysis of the selected questionnaires shows differences in sociocognitive skills between the two study groups, control and treated. In addition, differences were found in neuropsychological tests for the assessment of emotional contexts, as well as in the electrophysiological activity of the brain associated with these tests. This indicates a possible relationship between school adjustment problems and the development of some of the competencies related to emotional intelligence.

Methods

Participants

Fourty students. Their ages were ranged from 14 to 16 years.
No neurological or psychiatric impairment history
Normal (or corrected to normal) vision
Right-handed (Spanish abridged version of the Edinburgh Handedness Inventory (Oldfield, 1971)).

Two groups: Experimental group: 20 adolescents who presented **socio-academic adaptation problems (SAAP)**: a) significant school disadjustment, b) difficulties of educational insertion, c) support needs derived from late incorporation to the educational system or other personal or social characteristics and d) irregular schooling. Control group: 20 adolescents who did not show such poor academic or social development in the classroom.

Procedure

The evaluation was carried out by means of two different approaches: a first neurophysiological and psychocognitive approach and a second psychosocial one.

1) Psychosocial approach

A set of questionnaires that allowed us to study:

- Empathy (cognitive and affective components): Basic scale of empathy by Jolliffe and Farrington (2006).
- Impulsivity: Stress Management Subscale by Bar-On and Parker (2000).
- Social values: Adolescent Value Scale by Oliva and colleagues (2011).
- Communication or relational skills: Social skills scale by Oliva and collaborators (2011)

2) Psychocognitive approach

Emotional assessment tests: measurement of emotional skills. Participants evaluated emotional qualities in sets of images. Three tests:

- Other people's pain (a subtype of empathy) (Jackson, Meltzoff & Decety, 2004)
- Facial expression of emotions: Karolinska Directed Emotional Faces or KDEF (Lundqvist, Flykt & Öhman, 1998)
- International Affective Picture System or IAPS: with a wide range of emotionally positive (human expressions of affectivity, naturalistic beauty, babes and puppies, etc.) and negative contents (situations of social disadvantage, human and animal injustice, violence, etc.) (Lang, Bradley & Cuthbert, 2008)

3) Neurophisiological approach

Brain activity data from the electroencephalogram of the participants was collected during the execution of the psychocognitive tests. Brain activity, evoqued by stimuli (images), was statistically analyzed to obtain differences between groups.

Results

1) **Psychosocial results**:

Only the variables "cognitive component of empathy" and "social values", of the four variables studied, showed significantly higher values in the control group (Student's *t* test, P = 0.001 and P = 0.009 correspondingly) (Figure a).

2) **Psychocognitive results**:

- Empathy test:
  - Assessment of the level of pain of others: no significant difference (Figure b1)
  - Reaction time: longer reaction time in the control group (Mann-Whitney U Test; $0.01 > P \geq 0.001$) (Figure b2)

- KDEF emotional facial expression recognition test:
  - Control group found a significantly higher number of facial expressions for most emotions (Mann-Whitney U Test; ; $0.05 > P \geq 0.01$) (Figure c1)
  - Reaction time: no significant differences (Figure c2)

- IAPS image affective value assessment test:
  - Valence: The control group evaluated the unpleasant images more negatively than the experimental or SAAP group (Mann-Whitney U Test; $P < 0.001$). And this one more negatively than the population average (Mann-Whitney U Test; $P < 0.001$). Pleasant images showed no difference between groups (Mann-Whitney U Test; $P \geq 0.05$) (Figure d1)
  - Valence reaction time: higher reaction time in the control group (Mann-Whitney U Test; $P < 0.001$) (Figure d2)
  - Arousal: The control group evaluated the images that caused a higher state of alert more intensely than the SAAP group (Mann-Whitney U Test; $0.01 > P \geq 0.001$) and than the population average (Mann-Whitney U Test; $0.05 > P \geq 0.01$). The relaxing images showed no difference (Mann-Whitney U Test; $P > 0.05$). (Figure d3)
  - Arousal reaction time: higher reaction time in the control group (Mann-Whitney U Test; $0.05 > P \geq 0.01$) (Figure d4)

3) **Neurophisiological results**

During the assessment of others' pain, neuronal activity was significantly higher ($p < 0.05$, permutation Student's *t* test) in the control group (spots of blue color) in the frontal lobe and the left margin of the temporo-occipital lobes consistently. However, in the SAAP group it increased ($p < 0.05$, permutation Student's *t* test) in central and medial regions of the parietal lobe (spots of red color). (Figure b3)

Similarly happened during the recognition of emotions in facial expressions (figure c3). Most emotional facial expressions evoked similar brain activity among them, except for fear ((fifth column of the figure c3).

Conclusions

- Both the questionnaires and the psychocognitive tests showed differences between groups in various emotional and social skills that can be related to the SAAP variable (socio academic adjustment problems)
- Empathy, in its cognitive component, seems to be less develop in the group of adolescents with SAAP, based on the specific questionnaire and the test of pain assessment in others.
- Similarly, social values are less developed in this group as show the specific questionnaire for social values and the IAPS test images, related with social injustices and included in the unpleasant set.
- In addition, there is a different functioning of the cerebral cortex between groups, when stimulated by images with emotional content. That provides clues for explaining the differences between groups to achieve competences of emotional and social character.
- The greater oscillatory activity in the frontal regions in the control group could explain the greater reaction time in the choice of facial expressions of emotions.
- In addition, this greater activation of frontal, and particularly prefrontal regions, where functions such as emotional regulation are performed, could explain the better performance on tests at the expense of increased reaction time.
- The increased activity in the control group of the left temporo-occipital regions could explain the improved recognition of facial expressions (Furl et al., 2010).

Figures