Children’s Emotion Understanding: Preliminary Data of the Italian Validation Project of Test
of Emotion Comprehension (T.E.C.)
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In: F. Pons, M-F Daniel, L.Lafortune, P-A Doudin, O. Albanese (eds. 2006), Toward Emotional
Competences, (pp. 39-53), Aalborg University Press, Aalborg (Denmark)

Introduction

Children’s understanding of emotions is an aspect or ability which has met with special attention
within the body of research devoted to the development of emotional competence, that is the set of
skills that help recognize, understand, and respond consistently to other people’s emotions as well
as regulate the expression of one’s own (Saarni, 1999). With respect to that, the literature produced
in the field of developmental psychology falls within the theoretical framework of studies on
children’s theory of mind and meta-representational skills (Austing, Harris, Olson, 1988; Harris,
1989).

Based on the extensive investigations conducted in the last two decades (e.g. Harris, 1983;1991;
Harris, Olthof, Meerum Terwogt, 1981; Harris, Donnelly, Guz, Pitt-Watson, 1986; Bretherton,
Fritz, Zahn-Waxler, Ridgeway, 1986; Kestenbaum, Gelman, 1995; Lagattuta, Wellman, Flavell,
1997; Lagattuta, Wellman, 2001; Pons, Lawson, Harris, deRosnay, 2003; for a review: Grazzani,
Antoniotti in press), several authors have described well-identified developmental stages and
outlined their hierarchical relations in the development of emotion understanding (Pons, Doudin,
Harris, deRosnay, 2002).

The chapter by Pons, Doudin, Harris and deRosnay included in this book extensively illustrates the
hierarchical model, emphasising nine distinct components concerning the nature, the causes and
the regulation of emotions. Children develop an understanding of the different components between
three and eleven years of age. As put forward in the above-mentioned chapter, three different stages
may be identified (external, mental, reflective) according to which children perform experimental
tasks connected, at each stage, to the understanding of a few specific interrelated components (Pons,
Harris, deRosnay, 2004).

1. Test of Emotion Comprehension (T.E.C.)

Based on the theoretical model developed by P.Harris, F. Pons and Colleagues and illustrated in the
above-mentioned chapter as well as in previous publications (i.e. Pons, Doudin, Harris, deRosnay,
T.E.C. is in fact meant to assess the understanding of emotions in children aged three to eleven.
Such an understanding includes nine components (for a detailed description of these, see Pons,
Doudin, Harris, deRosnay’s contribution in this book) concerning the nature of emotions (two
components: recognition of basic emotions and understanding of mixed nature), the causes of
emotions (five components: the role of external causes, of remainders, desires, beliefs and moral
values), an the possibility to control the expression of emotions (two components: distinguishing
apparent and felt emotion, regulation of current experience).

T.E.C. consists of an A4 book (male and female versions) presenting series of cartoon scenarios
placed on the top of each page; the bottom part of the same page shows four possible emotional
outcomes depicted by facial expressions. The researcher first reads a short story while the child
looks at the cartoon scenario, and then asks the child to point at the appropriate facial expression
(child’s answer is typically non-verbal).

For instance, in order to assess children’s understanding of the external causes of emotions (one
component belonging to the “understanding of the causes” category) on the top of the page there is
a face without expressive cues and a present; the bottom part of the page shows four faces expressing different emotions (Fig. 1). The researcher, pointing at the child’s image says: “This child has just received a present for his birthday” and then asks, still pointing at the different expressions: “How does the child feel? Happy, sad, just alright or scared?”

**Insert here Fig. 1 from TEC**

*Figure 1. Understanding of external causes of emotions (Component II) (Pons, Harris, 2000)*

With the aim of assessing children’s understanding of mixed emotions (component included in the category “understanding the nature of emotions”), the top of another page shows a face without expressive cues and a bicycle, while the bottom part of the page includes four frames, only two of which show a single face expressing an emotion, while the remaining two include two faces expressing different emotions. The researcher, pointing at the child’s image says: “This child is looking at the beautiful bike he has just received as a present for his birthday. At the same time he is wondering whether he will fall and get hurt, as he cannot ride the bike yet”; then he asks, still pointing at the different expressions, “How does this child feel? Does he feel, happy, sad and scared, happy and scared, or scared?” (Fig. 2).

**Insert about here Figure 2 from TEC**

*Figure 2. Understanding of mixed emotions (Component VIII) (Pons, Harris, 2000)*

The test was initially administrated on a sample of 100 British children aged 3, 5, 7, 9 and 11, uniformly distributed by age and gender (Pons, Harris, deRosnay, 2004); the findings of this early research were largely confirmed by a further investigation conducted on 39 Indio Quechua Children, aged between 4 and 11 (Tennenbaum, Visscher, Pons, Harris, 2004).

The overall score and the answers to individual components grow fairly regularly with age, even though high individual variability is recorded in children’s response. The range within which correct answers fall, for each type of component, is very broad, even though a clear developmental pattern can be identified, as shown by the hierarchical analysis (Pons et al., 2004).

The hierarchical analysis (Pons et al., 2004) shows that the nine components are arranged in groups of three: within each group, an equivalent level of difficulty can be observed, while the three groups are hierarchically arranged, with the correct answer in a group implying the ability to answer correctly to questions in the lower level group. The components relevant to emotion recognition (I), to the influence of external causes of emotions (II) and to the role of memory (V) are to be found in the lower level of difficulty; the understanding of the role of desires (III), beliefs (IV) and the possible difference between felt emotion and facial expression (VII) is acquired at a subsequent stage; finally, the understanding of emotional ambivalence (VIII), of the moral dimension of emotions (IX) and of possibility of regulation (VI) reflect a higher level of mental elaboration attained only in late childhood or even later. Empirical findings, therefore, outline a developmental pattern slightly different from that theoretically postulated (and reflected by the roman number identifying each component). In particular, the understanding of the role played by desires is acquired later than expected in the theoretical model, based on the research conducted on the individual features of emotion understanding; in Table 1 differences vis a vis theoretical developmental model are marked with an arrow.

**Insert Table 1 around here**

TEC has shown good test-retest reliability correlation when administered to children aged 9 after three months $(r (18) = .84)$: Pons, Harris, Doudin, 2002; good stability in the administration to 40 respondents after thirteen months $(r (40) = .68)$ checking by age and gender, $r (38) = .54)$:
Tenenbaum et al. 2004; high correlation with language ability and cognitive development tasks (Tenenbaum et al. 2004).

2. The Italian Standardization

In Italy, a TEC Standardization Project has been started by a group of researchers of different universities, coordinated by Ottavia Albanese. The project currently involves Università degli Studi di Milano Bicocca, Università degli Studi di Torino and Università degli Studi di Roma “La Sapienza”; groups of researchers from other universities will soon join in.

The Italian version of the test has been translated by the Project group and edited by Francisco Pons, one of the authors, with whom administering procedures as well as inclusion criteria for children in the sample have been discussed.

In this paper we will present preliminary findings collected in Turin and Milan. Main objective of this first phase was to find out whether the results obtained in the original English sample could be repeated in the Italian context.

Our questions, therefore, concerned the possibility to compare the data collected in the two cities (Milan and Turin), these findings vs those relevant to the English sample, and, above all, the possibility to identify a hierarchical pattern in children’s answers.

This phase of the research involved participation of 367 children attending kindergarten and primary schools in Milan and Turin, aged 4-10, evenly distributed by gender and age, as shown in Table 2. possibilità

Insert Table 2 around here

3. Results

Data were collected in kindergartens in Turin and in primary schools in Milan. Data relevant to children aged 6 were collected in both cities (77 children, 22 in Turin and 55 in Milan): a comparison between the two groups showed no significant differences (t-test on independent samples conducted on overall score: \( t (75) = .377, P = .707 \)). On this basis, we concluded that the two samples could be considered as a single group.

As regards possibility to compare with the English sample, a first descriptive analysis highlighted that only component IV – understanding the role of beliefs - showed a pattern substantially different from expected, based on English findings. As a matter of fact, as shown in Table 3, the correct answer “happy” seems to become fairly stable starting with 6-8 years of age, while the answer “just alright”, which is wrong, seems to grow.

Insert Table 3 around here

This particular pattern led us to think that children gave a different interpretation with respect to what hypothesized by the authors, possibly linked to translation problems: in other words, children would answer “just alright” giving priority to the fact that the little rabbit did not worry as it did not know that the fox was hiding behind the bush, rather than “happy” because it was eating a carrot. We thus recoded the score relevant to Component IV, considering correct (1) both answers (“happy” and “just alright”). Having done so, our data widely overlap with those obtained in the original study by Pons and Harris. In subsequent stages of the research we will therefore use the new coding for component IV (Fig. 3).
Figure 4 shows the developmental pattern of the answers for all components: correct answers for all components regularly increase with age, and the difference in scores related to age is significant for all components (chi square (6), Kruskall Wallis Exact Test, Montecarlo Method: $P = .000$).

Overall score as well regularly increases with age. However, as observed also by Pons et al. (2004), individual differences are remarkable at any age (see Figure 5) (2).

No differences in overall score are recorded in relation to gender: we have checked through ANOVA [one-way ANOVA: $F (366) = .529; P = .468$]. The same is true for children having/not having siblings: in this case too we effected an ANOVA on overall score: $F (366) = .291; P = .590$. Individual differences appear therefore to be linked neither to gender nor to presence of siblings and call for further investigation.

Unlike Pons et al. (2004), in order to analyse the hierarchical pattern of answers, we used Mokken Scales (Mokken, 1971, van Schuur, 2003): such a scale performs a hierarchical analysis to obtain items rank-ordered by difficulty, it calculates an homogeneity index (H-Item) for the various items and a cumulative index (H-Scale) for the whole scale.

“Homogeneity […] is defined by relating the number of model violations observed (denoted as the number of errors observed or $E(\text{obs})$) to the number of violations that can be expected under the model of stochastic independence (denoted as $E(\text{exp})$)” (van Schuur, 2003, p. 17-18)

This index helps determine whether the lower number of correct answers for a given item considered more difficult than another varies significantly with respect to the number of the expected answers in case of stochastic independence, and therefore of equivalent difficulty for the two items considered. Empirically, Scales with $H > .30$ and Rho $\geq .70$ are considered acceptable (van Schuur, 2003).

The hierarchical pattern recorded among the various scales, even though not thoroughly satisfactory, is encouraging: seven out of nine items provide and acceptable Mokken scale ($H = .40$, Rho $= .68$), with the pattern shown in Table 4, in line with what theoretically expected.

4. Discussion and Conclusions

The tool offers promising features vis a vis the objective of performing an overall assessment of children competence in understanding the nine components of emotional experience over a wide range of ages (4-10, in our case). In particular, results show a clear developmental pattern in answers, which is not linked to gender or to experience with siblings. While meaningful efforts are still required in order to achieve a true standardization of the tool, our first analyses are promising. Our work highlighted a developmental pattern which is partially different from that identified by Pons et al. (2004); however, the developmental profile obtained by our group largely matches the expected one, based on theoretical as well as experimental evidence, as shown by the comparison between our profile and that outlined in the English study presented in Table 5.
We have not discussed in depth here the hypothesis put forward by Pons et al. (2004, see in other chapters of this book) and concerning the possibility to arrange the development of emotional understanding in three periods, each grouping several competences considered to be equivalent: partly because the hierarchical development observed in our sample is different, thereby calling for further reflection on the developmental pattern of this kind of competences with respect to what has been theoretically put forward and empirically investigated; partly because the use of a hierarchical analysis tool like Mokken Scales support the hierarchical pattern, thereby leading to a legitimate use of the overall score. Nevertheless, as charts in Figure 4 show, the pattern of answers could be referred to different profiles for the different components, profiles which can in turn be grouped into three different modalities. Should such differences be stable also in the broader overall sample on which the Italian standardization will be performed, we would certainly be faced with an interesting aspect calling for further and deeper investigation.

In our view, the major asset in the tool lies in the fact that it is simple in conception and leading to a clear identification of a developmental pattern, including different components and varying levels of difficulty. While this involves some degree of simplification for a few aspects of the more complex components, such simplification is compensated for by the usefulness of a tool that can assess the development of children’s understanding of emotions in a wide range of ages. Furthermore, the role cognitive competence plays with respect to specific aspects of emotional comprehension is still an open issue: a clearer understanding of these two aspects will be pursued by investigating the development of emotional understanding in non normative samples of children with specific relational problems or cognitive delay.

Scholars in the field of metacognition and learning (Albanese, Doudin, Martin, 2003; Lafortune, Mongeau, 2002; Lafortune, Doudin, Hancock, Pons, 2004; Pellerey, 2003; Grazzani Gavazzi, 2004) emphasize how several difficulties in the school context would be related to disorders in emotion understanding that T.E.C. could help detect. The use of T.E.C. would, on the one hand, help identify these disorders, and on the other provide a basis to conceive emotional education projects from a metacognitive perspective (Pons, Harris, Doudin, 2002) which may jointly address cognitive and emotional-affective developmental issues.

Note
(1) We have discussed such a choice with one of the authors (Francisco Pons): it clearly needs further checking, through a change in the vocabulary used, which we intend to do in the subsequent phases of the research.
(2) These graphs are Box-Plot Graph: the lower boundary of the box is the 25\textsuperscript{th} percentile, and the upper is the 75\textsuperscript{th}; the horizontal bold line inside the box represents the median value; vertical lines (whiskers) indicate the range of responses. Extreme cases, i.e. cases with values that are more then 3 box-lengths from the upper or lower edge of the box, are reported with an asterisk (*); outliers, i.e. cases with values that are between 1.5 and 3 box-lengths from the upper or lower edge of the box, are reported with a circle (°).

5. Bibliografia

van Schuur, W.H. (2003), Mokken Scale Analysis: Between the Guttman scale and parametric Item Response Theory, *Political Analysis*, 11 (1), 139-163
Table 1: The development of emotion comprehension (Pons, Doudin, Harris, de Rosnay, 2002)

<table>
<thead>
<tr>
<th>Age</th>
<th>Understanding of emotion’s nature</th>
<th>Understanding of emotion’s causes</th>
<th>Understanding of emotion’s control</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-5 years (<em>External</em>)</td>
<td>Categorization of basic emotions on the basis of facial expression (joy, sadness, fear, anger) (I)</td>
<td>External causes of emotions (II)</td>
<td>Role of memory on present emotional states (V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Role of desires on emotions (III) ▼</td>
<td></td>
</tr>
<tr>
<td>6-7 years (<em>Mental</em>)</td>
<td>Mixed emotions <em>(VIII)</em> ▼</td>
<td>Role of beliefs on emotions (IV)</td>
<td>Hiding an emotional state (VII)</td>
</tr>
<tr>
<td>9-11 years (<em>Reflective</em>)</td>
<td></td>
<td>Role of morals on emotions (IX)</td>
<td>Controlling an experienced emotion (VI)</td>
</tr>
</tbody>
</table>
### Table 2: Sample

<table>
<thead>
<tr>
<th>Age</th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td>10</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>5 years</td>
<td>12</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>6 years</td>
<td>33</td>
<td>44</td>
<td>77</td>
</tr>
<tr>
<td>7 years</td>
<td>32</td>
<td>26</td>
<td>58</td>
</tr>
<tr>
<td>8 years</td>
<td>33</td>
<td>34</td>
<td>67</td>
</tr>
<tr>
<td>9 years</td>
<td>35</td>
<td>33</td>
<td>68</td>
</tr>
<tr>
<td>10 years</td>
<td>33</td>
<td>24</td>
<td>57</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>188</strong></td>
<td><strong>179</strong></td>
<td><strong>367</strong></td>
</tr>
</tbody>
</table>
Table 3: Responses for the Component IV (Comprehension of Belief)

<table>
<thead>
<tr>
<th>Age</th>
<th>Happy</th>
<th>Just alright</th>
<th>Angry</th>
<th>Scared</th>
<th>Missing</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 years</td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 years</td>
<td>37</td>
<td>13</td>
<td>1</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 years</td>
<td>30</td>
<td>13</td>
<td></td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 years</td>
<td>41</td>
<td>19</td>
<td></td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 years</td>
<td>39</td>
<td>24</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
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<tr>
<td>10 years</td>
<td>36</td>
<td>16</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>194</td>
<td>90</td>
<td>5</td>
<td>77</td>
<td>1</td>
<td>367</td>
</tr>
</tbody>
</table>
Table 4: Mokken Scale (N=367)

<table>
<thead>
<tr>
<th>Items included</th>
<th>Mean</th>
<th>H Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component I</td>
<td>0.96</td>
<td>0.68</td>
</tr>
<tr>
<td>Component II</td>
<td>0.91</td>
<td>0.53</td>
</tr>
<tr>
<td>Component III</td>
<td>0.81</td>
<td>0.39</td>
</tr>
<tr>
<td>Component IV</td>
<td>0.77</td>
<td>0.32</td>
</tr>
<tr>
<td>Component V</td>
<td>0.74</td>
<td>0.37</td>
</tr>
<tr>
<td>Component VII</td>
<td>0.69</td>
<td>0.32</td>
</tr>
<tr>
<td>Component VIII</td>
<td>0.45</td>
<td>0.49</td>
</tr>
</tbody>
</table>

**Items excluded:**
- Component IX
- Component VI

H Scale (7 items) = 0.40, Rho = 0.68
### Table 5: Hierarchical Pattern in English and Italian samples

<table>
<thead>
<tr>
<th>England</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N=100 (3-11 anni)</strong></td>
<td><strong>N=367 (4-10 anni)</strong></td>
</tr>
<tr>
<td>I Recognition</td>
<td>I Recognition</td>
</tr>
<tr>
<td>V Reminder</td>
<td>II Cause</td>
</tr>
<tr>
<td>II Cause</td>
<td>III Desire</td>
</tr>
<tr>
<td>IV Belief</td>
<td>IV Belief</td>
</tr>
<tr>
<td>III Desire</td>
<td>V Reminder</td>
</tr>
<tr>
<td>VII Hiding</td>
<td>VII Hiding</td>
</tr>
<tr>
<td>IX Morality</td>
<td>IX Morality</td>
</tr>
<tr>
<td>VI Regulation</td>
<td>VI Regulation</td>
</tr>
<tr>
<td>VIII Mixed</td>
<td>VIII Mixed</td>
</tr>
</tbody>
</table>
Figure 1. Comprehension of external causes of emotion (Component II) (Pons, Harris, 2000)
Figure 2. Comprehension of mixed emotions (Component VIII) (Pons, Harris, 2000)
Figure 3: Component IV and recoded Component IV by age
Figure 4: Profiles of responses for the nine components by age
Figure 5: Overall score by age

**Note:**
These graphs are Box-Plot Graph: the lower boundary of the box is the 25\textsuperscript{th} percentile, and the upper is the 75\textsuperscript{th}; the horizontal bold line inside the box represents the median value; vertical lines (whiskers) indicate the range of responses. Extreme cases, i.e. cases with values that are more than 3 box-lengths from the upper or lower edge of the box, are reported with an asterisk (*); outliers, i.e. cases with values that are between 1.5 and 3 box-lengths from the upper or lower edge of the box, are reported with a circle (°).