



## Sex differences in emotional and meta-emotional intelligence in pre-adolescents and adolescents

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### ARTICLE INFO

#### Keywords:

Emotional intelligence  
Meta-emotional intelligence  
Sex  
Age  
Pre-adolescence  
Adolescence

### ABSTRACT

The study focuses on sex differences in emotional and meta-emotional intelligence in a sample of 355 pre-adolescents and 164 adolescents. Emotional and meta-emotional intelligence were measured using the multi-trait multi-method IE-ACCME test, allowing to define individuals' profiles of ability EI, emotional self-concept, meta-emotional knowledge, meta-emotional ability in self-evaluation and meta-emotional beliefs. Meta-emotional dimensions refer to the awareness of individuals about their emotional abilities and to their beliefs about the functioning of emotions in everyday life. Results demonstrated that girls scored better than boys in ability-EI, in particular in adolescents' group, whereas boys reported higher score than girls in emotional self-concept in both groups of age. Result about meta-emotional knowledge and meta-emotional ability in self-evaluation revealed that boys systematically overestimate their emotional abilities whereas girls, particularly in the adolescent group, tend to underestimate them. Finally, in both age groups, girls scored higher than males in metaemotional beliefs.

The adoption of the meta-emotional intelligence framework may help to explain the discordances about sex differences found in previous studies using self-report vs. performance measures of EI. Moreover, it may contribute to shed light on the nature-nurture debate and on the role of meta-emotional variables for explaining sex differences in EI.

### 1. Introduction

Sex differences has always been a key field of research, which has gathered contributions from various disciplines over time. Studies show that men and women share both similarities and differences not only under geno- and pheno-typical perspectives but also under many personal, social, cultural and emotional aspects. A review by Sánchez-Núñez et al. (2008) argued that there are consistent differences among males and females in many emotional abilities: females have been described in many studies as more able than males in recognizing other people's emotions, as well as more perceptive and empathetic (Argyle, 1990; Hargie et al., 1995; Lafferty, 2004; Tapia & Marsh, 2006; Trobst et al., 1994) and females experiences positive and negative emotions more intensely than males (Grossman & Wood, 1993). A meta-analysis by Else-Quest et al. (2012) highlighted some gender gap in experiencing self-conscious emotions (i.e., guilt, shame, pride and embarrassment). The authors found that women felt more guilt and shame than males and this difference tend to increase across the age groups.

Indeed, they found significant gender differences in guilt and shame in adolescents and adults but not in children.

Sex differences in emotional experience have been explained by referring to both biological and social factors. The very famous "extreme male brain theory of autism" proposed by Baron-Cohen (2002), supports the idea that the feminine brain is predominantly structured to feel empathy, while the masculine brain predominantly seeks to understand and construct systems. Specific areas of the brain dedicated to emotional processing can be larger in women than in men (Baron-Cohen, 2002, 2003) and some other studies demonstrate that cerebral processing of emotions differs between men and women (Craig et al., 2009; Jaušovec & Jaušovec, 2005).

As for social factors influencing sex difference in experiencing emotions, Sánchez-Núñez et al. (2008) discuss how social communication and educational styles, since childhood, may be responsible for these differences: girls are more often exposed to stories where love and affective terms are predominant, and they are more involved in games with dolls where behaviors of caring and protections towards others are

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encouraged by parents. On the contrary, males are most often exposed to stories with brave heroes whose values are war and fighting, or they are most often involved in games with cars, robots and other mechanical toys. However, it is a matter of fact that, by adults, sex difference in living emotions become more and more evident, and they are also supported by sex differences in occupational choices. [Tay et al. \(2019\)](#), for instance, showed that men are “things-oriented”, being more interested in occupations focusing on disease management. On the contrary, women are “people-oriented”, being more interested in occupations focusing on psychosocial management.

### 1.1. Sex differences in emotional intelligence

As it might be expected, also scientific literature focusing on emotional intelligence (EI), demonstrated that there are consistent differences among males and females in emotional dimensions. However, the size and sometimes also the direction of such differences is highly influenced by the EI theoretical framework underlying studies and by the measurement methods that are used for assessing EI. Indeed, there are at least three main approaches conceiving emotional intelligence: the ability model ([Mayer & Salovey, 1997](#); [Salovey & Mayer, 1990](#)) the trait models ([Petrides & Furnham, 2000, 2001](#)) and the mixed models ([Bar-On, 1997](#); [Goleman, 1995](#)). [Mayer and Salovey \(1997\)](#) defined ability EI as an interrelated set of cognitive abilities involved in emotional problem solving. [Petrides and Furnham \(2000, 2001\)](#) conceived trait EI as a series of emotion related personality traits. [Bar-On \(1997\)](#) and [Goleman \(1995\)](#); see also [Boyatzis, 2009](#); [Boyatzis et al., 2000](#)) conceive EI as a constellation of traits and emotion-related skills or competencies and for this reason it has been defined as mixed EI. The different theoretical approaches to EI correspond also to different measurement methods: [Mayer and Salovey \(1997\)](#) argued that, since EI is a form of intelligence, it should only be measured by performance test like MSCEIT ([Mayer et al., 2002](#)) or STEM and STEU ([MacCann & Roberts, 2008](#)) requiring individuals to solve emotional tasks or problems. [Petrides and Furnham \(2000, 2001\)](#), supporting the trait model of EI, adopted self-report methodologies that are widely used in measuring personality traits. Consistent with the mixed models of EI, researchers use mixed methods: [Bar-On \(1997\)](#) made a scale based on self-report, while [Sala \(2002\)](#) created a scale based on both self-report and other-report methodologies based on the [Goleman EI model \(1995\)](#). A further group of assessments tools ([Brackett et al., 2006](#); [Brackett & Mayer, 2003](#); [Law et al., 2004](#); [Schutte et al., 1998](#)) have been defined as self-reported ability EI ([Gutiérrez-Cobo et al., 2016](#)) since they use self-report methodologies but are focused only the [Mayer and Salovey \(1997\)](#) ability model of EI and do not include personality traits or competencies related to emotions.

The focus on different theoretical models and measurement's tools is crucial in the field of sex differences in EI. In fact, when EI is measured as an ability using performance tasks, the results show quite consistently that females score higher than males. This result was found in studies involving adults and using the MEIS test ([Mayer et al., 1999](#)) as well as the MSCEIT test ([Day & Carroll, 2004](#); [Mayer et al., 2002](#)). In the latter case, the most significant differences are in the Emotional Management branch, where women score much higher than men, while slight differences are found in the Emotional Understanding branch, particularly in tasks related to understanding emotional change ([Mayer et al., 2002](#)). These results were confirmed by [Curci and D'Amico \(2010\)](#) in Italian adults sample, and by [Fernández-Berrocal et al. \(2012\)](#), [Cabello et al. \(2016\)](#) and [Gutiérrez-Cobo et al. \(2016\)](#) in Spanish adults sample. In these last cases, authors claimed also that age influences sex differences in ability EI ([Cabello et al., 2016](#); [Gutiérrez-Cobo et al., 2016](#)).

When EI is measured using self-report scales, however, women do not always score higher than men. This occurs when self-report scales are based on whether trait models, mixed model or ability models.

[Petrides and Furnham \(2000\)](#) did not observe gender differences in adults' total EI level measured by EQ-i ([Bar-On, 1997](#)); on the contrary,

they observed that sex difference had different direction depending on the EQ-i's subscale: women scored higher than men in the “interpersonal” scale, while men score slightly higher than women in the “intrapersonal”, “stress management” and “adaptability” scales. However, these results have not been confirmed in studies by [Dawda and Hart \(2000\)](#) that did not find sex differences in the EQ-i total score or the EQ-i composite scales. A more recent study by [Meshkat and Nejati \(2017\)](#) involving Iranian undergraduate university students showed that there was no significant difference between genders on EQ-i, even if females scored higher than males in emotional self-awareness, interpersonal relationship, self-regard, and empathy.

When EI is measured using Emotional Competence Inventory (ECI), the self-report tool developed by [Sala \(2002\)](#) and inspired by the EI model by [Goleman \(1995\)](#), women obtain again significantly higher total scores than men. In addition, [Khan and Bat \(2013\)](#) using Emotional Intelligence Scale, a trait-based measure, found that boys have higher level of emotional intelligence than girls. [D'Amico et al. \(2020\)](#) examined also sex differences using the Wong and Law Emotional Intelligence Scale ([Law et al., 2004](#)) based on the [Mayer and Salovey \(1997\)](#) model, finding that women obtained higher score than men only in Others' Emotion Appraisal and Use of Emotion subscales, whereas there were no sex differences in Self-Emotion Appraisal and Regulation of Emotion subscales.

Studies that investigated both ability and self-reported EI in the same sample of participants, demonstrated that females performed higher than males only in ability EI but not in self-reported EI. [Brackett and Mayer \(2003\)](#), in particular, found significant gender differences on the MSCEIT, with women scoring higher than men, but did not obtain sex differences on the EQ-i scale, nor on the self-reported ability EI scale by [Schutte et al. \(1998\)](#) that is based on the Mayer & Salovey model.

There are less studies about sex differences in EI involving pre-adolescents and adolescents, also because first tools for measuring EI were initially available only for adults. One of the first studies was conducted by [Ciarrochi et al. \(2001\)](#) using the scale by [Schutte et al. \(1998\)](#). The authors found that girls reported higher scores only in their ability to manage others' emotions and to perceive emotions, while there were no sex differences in personal management scores. [Charbonneau and Nicol \(2002\)](#), using the same scale by [Schutte et al. \(1998\)](#) confirmed these results, reporting higher levels of total EI in girls than in boys. Finally, [Ciucci et al. \(2009\)](#), using the Italian version of the scale by [Schutte et al. \(1998\)](#) in pre-adolescents, found that girls scored higher than boys in the dimension of assessing the emotions of others and in the regulation and use of emotions, but not in the assessment and expression of one's own emotions.

First studies on ability EI were conducted by [Rivers et al. \(2012\)](#) using the research young version of MSCEIT ([Mayer et al., 2014](#)) in pre-adolescents from 10 to 13 years. Authors demonstrated that girls reported higher scores than boys in total EI score and in perceiving, using, and understanding emotions branches. Moreover, they evidenced that results varied across age, with 10-year-olds scoring significantly lower than 11- through 13-year-olds, and that an interaction sex by age indicated that only scores of girls increased significantly with age among girls from 10 to 12 years.

In conclusion, literature about sex difference in EI demonstrated that both women and girls score higher than men and boys in performance test, while results regarding sex difference in self-report scales of EI are quite inconsistent: women/girls score higher than men/boys only in some subscale and sometimes males score higher than females. It is therefore interesting to focus more deeply on sex differences, trying to understand why size and directions of sex difference in EI depends so heavily on the type of measurement tool used (ability test vs. self-report scale). One possibility, firstly suggested by [Ciarrochi et al. \(2001\)](#) is that girls tend to underestimate their own emotional abilities, obtaining lower scores in self-report scale compared to ability test scores. Conversely, we could say that males tend to overestimate their emotional abilities, obtaining higher self-report scores than emotional

ability test scores. In the next paragraph, we will examine the possible sources of underestimation/overestimation of EI, in the light of the recent construct of meta-emotional intelligence (D'Amico, 2013, 2018).

### 1.2. Sex differences in meta-emotional intelligence

Meta-emotional intelligence (D'Amico, 2013, 2018) has been defined, in general, as the awareness of one's own EI, and it may be esteemed using the IE-ACCME test (D'Amico, 2013), an original multi-trait-multi method tool for pre-adolescents and adolescents. In D'Amico's perspective (2013, 2018), emotional and meta-emotional intelligence have not to be considered as opposite but rather complementary constructs. In this new framework, the Mayer and Salovey (1997) concept of EI as an ability belonging to the domain of cognitive abilities (MacCann et al., 2014) is preserved; at the same time, the measurement of ability EI is enriched by a series of measures allowing to understand, also, pre-adolescents and adolescents' self-concept towards their EI, to what extent they are aware of their ability EI in everyday and in testing situation, and what beliefs about emotions drive their thinking and their behaviors.

Ability EI, similarly to MSCEIT (Mayer et al., 2002), is measured using an original performance test with eight tasks exploring perception, facilitation, understanding and management of emotions. Emotional self-concept is measured using a self-report scale requiring pre-adolescents and adolescents to report their abilities in perceiving, facilitating, understanding, and managing emotions in everyday life. A self-rating scale that is presented after each task in the ability test allow to understand to what extent they are able to evaluate of their performance. Finally, meta-emotional beliefs are measured using a questionnaire exploring beliefs and convictions about the emotional sphere.

The new framework of meta-emotional intelligence has already given interesting insight about sex differences. The set of results obtained with the whole sample of pre-adolescents and adolescents comprised in the standardization of IE-ACCME (D'Amico, 2013) demonstrated that girls and boys show different results in almost all aspects of IE-ACCME test. Even if eta values are not always very high, there is a very interesting pattern in sex differences. In particular, when emotional abilities are concerned, girls scored higher than boys in perception ( $t = -7.46, p < .001, \eta = 0.04$ ), facilitation ( $t = -3.40, p < .001, \eta = 0.15$ ), and managing of emotions ( $t = -10.43, p < .001, \eta = 0.08$ ), whereas there are no sex differences in understanding of emotions. On the contrary, when emotional self-concept is considered, girls report higher scores than boys only in perception of emotions ( $t = -3.18, p < .001, \eta = 0.01$ ), while boys report higher scores than girls in understanding ( $t = 3.82, p < .001, \eta = 0.01$ ) and managing of emotions ( $t = 2.98, p < .05, \eta = 0.01$ ), and there are no sex differences in facilitation. Females, however self-rate higher than males their performance in the ability test: girls reported higher scores in self-rating scale about performance than males in total score ( $t = -2.54, p < .05, \eta = 0.00$ ) and in facilitation ( $t = -2.53, p < .05, \eta = 0.00$ ), and managing of emotions ( $t = -3.62, p < .001, \eta = 0.00$ ).

The low concordance between results of boys and girls in emotional self-concept scale, self-rating scale about performance and emotional ability test, suggested that girls and boys have different profiles of meta-emotional intelligence, in terms of awareness of both their emotional abilities in everyday life and in testing situation. A qualitative way to look at these profiles is represented in Table 1 (drawn from D'Amico, 2018).

The first column shows the number of pre-adolescents and adolescents in standardization sample obtaining a standard score on emotional self-concept scale or in the self-rating about performance scale that is at least 15 standard points lower than the score on the ability test, and who therefore underestimate their emotional abilities in typical situations or in the testing situation. In the middle column there is the number of participants whose score is similar (a difference not higher or lower than 1 standard deviation in the three scales); in the third column there is the

**Table 1**

Each cell reports the number of participants in the standardization sample of IE-ACCME test that showed a discrepancy higher or lower than 15 standard points (1 standard deviation) in the different scales of the IE-ACCME test.

	CMeta: discrepancy between CME and AE		
	CME < AE	CME = AE	CME > AE
F	83	393	92
M	43	388	112
TOT	126	781	204

  

	AVMeta: discrepancy between AP and AE		
	AP < AE	AP = AE	AP > AE
F	86	394	88
M	47	392	104
TOT	133	786	192

Note. Table drawn from D'Amico (2018). CME = Emotional Self-Concept; AE = Emotional Ability; AP = Self-Rating about Performance in the Emotional Ability Test; CMeta: Meta-Emotional Knowledge; AVMeta = Meta-Emotional Self-Evaluation.

number of participants who, for each comparison, scored at least one standard deviation above the ability test score, and who therefore overestimate their emotional abilities in typical situations or in the testing situation. It is useful to remember that both underestimation and overestimation indicate poor meta-emotional knowledge and/or poor meta-emotional self-evaluation ability.

Looking at the Table 1, it is evident that the most of pre-adolescents and adolescents are in the central column, reporting adequate meta-emotional knowledge ( $n = 781$ ) and meta-emotional self-evaluation ( $n = 786$ ). However, there is also a high number of participants who underestimate their emotional abilities in everyday situation ( $n = 126$ ) or who overestimate them ( $n = 204$ ) demonstrating that they have poor meta-emotional knowledge. Similarly, there are many pre-adolescents and adolescents who underestimate their emotional abilities in the testing situation ( $n = 133$ ) or who overestimate them ( $n = 192$ ) demonstrating a poor meta-emotional self-assessment ability.

Considering sex differences, it is easy to see that there is almost an equal number of girls who underestimate or overestimate their emotional abilities, both in typical situations and in testing situations. Among boys, on the contrary, overestimation is much more frequent, with a ratio higher than 2:1 compared to underestimation. In general, these results demonstrate that underestimation is more frequent among girls whereas overestimation is very frequent among males.

Another interesting result about sex differences obtained during the standardization of IE-ACCME (D'Amico, 2013) refers to meta-emotional beliefs scores: girls reported indeed higher scores than boys in total meta-emotional beliefs score, as well as in perception, facilitation and understanding of emotion subscales. These results demonstrate that beliefs system of girls towards emotions, compared to boys', is more consistent with current scientific knowledge on emotional intelligence.

More recently D'Amico and Geraci (2021) used a quantitative method for computing meta-emotional knowledge and meta-emotional self-evaluation scores: meta-emotional knowledge score is computed as the difference between emotional self-concept and emotional ability, weighed on emotional ability. Moreover, meta-emotional knowledge is measured both considering size and the direction of estimation errors. The size (absolute score) indicates the level of meta-emotional knowledge: the higher is the discrepancy score, the lower is the meta-emotional knowledge. The direction of estimation error (relative score) allows understanding if respondents tend to overestimate (positive score) or underestimate (negative score) their emotional abilities in everyday life. Similarly, the meta-emotional self-evaluation ability corresponds to the difference between scores on self-rating scale about performance and emotional ability, and also in this case it is weighed on

the emotional ability score. Meta-emotional self-evaluation ability indicates to which degree the performance of participants in the ability test corresponds to their self-evaluation of performance after each task, and it is again measured in absolute and relative value. The meta-emotional self-evaluation ability score in absolute values allows understanding if respondents are able to estimate their performance in the ability test (the higher the absolute discrepancy score the lower the meta-emotional self-evaluation ability), whereas the score expressed in relative value indicate if they tend to overestimate (positive score) or underestimate (negative score) their performance in testing situation.

Using this scoring system, D'Amico and Geraci (2021) measured also sex differences in a new sample of pre-adolescents, finding that there are slight differences in IE-ACCME scores among boys and girls, with a tendency to overestimation in boys. However, *t*-tests revealed that such differences have not statistical significance. Thus, it is not completely clear if the pattern of overestimation in boys and underestimation in girls that we have outlined in standardization sample, comprising both pre-adolescents and adolescents, may be founded also in other samples and/or if it is present only among adolescents but not in pre-adolescents.

### 1.3. The present study

The present study aimed at examining the sex differences in emotional and meta-emotional intelligence, in a new large population of pre-adolescents and adolescents. Considering the results about sex differences in EI obtained in previous scientific literature and in studies by D'Amico (2013, 2018) validation of IE-ACCME test, we expected to find: a) higher score in boys than in girls in emotional self-concept; b) higher scores in girls than boys in ability EI; c) sex differences in meta-emotional knowledge and meta-emotional self-evaluation, indicating in particular a tendency to overestimation in boys and to underestimation in girls; d) higher scores in girls than boys in self-rating scale about performance; e) higher scores in girls than boys in meta-emotional beliefs. Moreover, we were also interested in examining if sex differences varied between pre-adolescents and adolescents, considering the age by sex interaction evidenced by Rivers et al. (2012) in ability-EI and the recent results obtained by D'Amico and Geraci (2021) in pre-adolescents.

## 2. Method

### 2.1. Participants and procedure

The study involved a sample of 519 participants (295 girls, 224 boys), belonging to two subgroups: the pre-adolescents' group was composed of 355 students (183 girls, 172 boys), between 10 and 13 years ( $M = 11.98$ ,  $SD = 0.23$ ); they attended ten classes of five Italian secondary lower schools (two classes for each school). The adolescents' group was composed of 164 students (112 girls, 52 boys), between 13 and 18 years ( $M = 15.48$ ,  $SD = 1.23$ ). They attended six classes of various Italian secondary higher school in metropolitan area.

The classes that attended to the research were selected by school principal, based on a research agreement. Parents of all participants involved in the study signed an informed consent. All participants completed the test at school, in a single collective session. All students in each class were asked to complete the test.

### 2.2. Instruments

#### 2.2.1. Emotional and meta-emotional intelligence

Emotional and meta-emotional intelligence of participants was measured using the multi-trait and multi-method tool IE-ACCME (Intelligenza Emotiva: Abilità, Credenze e Concetto di Sé Meta-Emotivo; D'Amico, 2013). As already described, the IE-ACCME is an Italian original test specifically developed for pre-adolescents and adolescents. It is based on the Mayer and Salovey's (1997) four-branch

theoretical model, even if it is not designed only to measure ability EI. Rather, it uses four different scales that can be used for calculating scores in: 1) ability EI; 2) emotional self-concept; 3) meta-emotional knowledge; 4) meta-emotional ability in self-evaluation; 5) meta-emotional beliefs.

All items of IE-ACCME were formulated considering the use of high frequency words and the sentence are not too long, to facilitate reading understanding by pre-adolescents and adolescents.

During administration, the first tool presented is the meta-emotional beliefs scale (CE scale). It includes 16 items with five-point Likert scale ranging from 0 (not true) to 4 (definitely true) that explore individuals' beliefs about perception, facilitation, comprehension, and management of emotions. After validation, however, only eight items, that explained the 60.2% of variance and focus on the four branches and eight tasks of EI, were selected for computing the CE score. The CE score represents the degree to which people believes that each aspect of emotion included in the EI ability-based model is important and influences everyday life (i.e., if they believe that sensations produce emotions, that emotions can facilitate thinking, that emotions may be blended each others, or that emotions can be regulated). One of the items is, for instance: "Complex feelings like love or friendship arise from a mixture of many emotions".

The second scale presented is the emotional self-concept scale (CME scale), exploring self-perceived ability in perception, facilitation, comprehension, and management of emotions. CME scale includes 20 items with five-point Likert scale ranging from 0 (not true) to 4 (definitely true). Even in this case, validation procedure revealed that a solution with eight items, focusing on the four branches and eight tasks of EI, explained the 60.54% of variance and were then selected for computing the CME score. Items ask people to evaluate their emotional abilities in everyday situation (e.g., "I am able to identify the emotions that derive from particular physical sensations"). The CME score represents the degree to which people consider themselves to be able in perceiving, using, understanding, or managing emotions in everyday life.

The third scale is the maximum performance test (AE scale) used for assessing ability EI. The AE scale is inspired by (Mayer et al., 2002) and includes eight tasks grouped in four branches: 1) perception of emotions (faces and pictures); 2) facilitation of emotions in cognitive processes (use and sensations); 3) understanding of emotions (blends and transformations); 4) management of emotions (personal and interpersonal management). The scale has been scored using the consensus scoring method (Mayer et al., 2002); the consensus sample was composed of 1.084 Italian adolescents: 526 males and 558 females, between 10 and 19 years recruited in southern, central and northern Italy.

After each one of the eight ability EI task, adolescents are requested to self-rate their performance in the task with a six-point Likert scale ranging from 0 (not able) to 5 (very able). These scores compose the self-rating about performance scale (AP).

Standardization and validation of the IE-ACCME test was performed on the consensus sample. Structural validation confirmed through explorative and confirmatory factorial analyses that all IE-ACCME scale reflect Mayer and Salovey's (1997) four-branch and eight tasks structural model. However, as discussed before, scores of CME, AE and AP are very slightly correlated or at all with each other's (AE vs. CME:  $r = 0.04$ ,  $p > .05$ ; AE vs. AP:  $r = 0.09$ ,  $p < .01$ ), indicating that they measure different aspects of emotional sphere. A significant correlation was found only between AE and CE ( $r = 0.31$ ,  $p < .05$ ), indicating that people owning a beliefs system about emotions that is consistent with EI theorization own good levels of emotional abilities and vice versa. CE total score is only slightly related to CME total score ( $r = 0.18$ ,  $p < .05$ ).

All scales present acceptable reliabilities (test-retest: CE,  $r = 0.43$ ,  $p < .001$ ; CME,  $r = 0.76$ ,  $p < .001$ ; AE,  $r = 0.44$ ,  $p < .001$ ; AP,  $r = 0.55$ ,  $p < .001$ ; split-half: AE scale = 0.86; D'Amico, 2013). Cronbach's alpha was not computed for the IE-ACCME total scores, due to the small number of items in the CE, CME and AP scales (8), and because the items in the total

AE scale are rather heterogeneous (D'Amico, 2013). All scores of CE, CME, AE and AP are expressed as standardized scores with a mean of 100 and a standard deviation of 15. The meta-emotional knowledge scores in absolute and in relative values (CMetaAbs and CMetaRel) are then calculated as (CME-AE)/AE. Similarly, the meta-emotional self-evaluation ability score in absolute and relative values (AVMetaAbs and AVMetaRel) are computed as (AP-AE)/AE. A schematic description of IE-ACCME test structure and scoring is presented in Table 2.

In conclusion, in this study we used 8 scores for each participant, such as: 1) standardized total score of emotional ability (AE); 2) standardized total score of emotional self-concept (CME); 3) self-rating about performance scale (AP); 4–5) weighted total score of meta-emotional knowledge in absolute and relative values (CMetaAbs and CMetaRel); 6–7) weighted score of meta-emotional self-evaluation in absolute and relative values (AVMetaAbs and AVMetaRel); 8) standardized total score of meta-emotional beliefs (CE).

### 3. Results

Data analyses were carried out using Microsoft excel for data setting and SPSS for statistical analyses.

Descriptive statistics are presented in Table 3, where IE-ACCME mean scores are divided by sex and age.

In order to examine sex and age differences and interactions with IE-ACCME test scores, we carried out a 2 (sex: boy, girl) by 2 (age: pre-adolescents, adolescents) series of univariate analysis of variance (ANOVAs), with each IE-ACCME total score as dependent variable (see Table 4).

Results of univariate ANOVAs revealed significant sex differences and interaction Sex×Age in some variables, though partial  $\eta^2$  values indicate small effect size. Analyses of emotional ability (AE) revealed significant sex differences  $F(1, 518) = 8.55, p < .005, \text{partial } \eta^2 = 0.02$ , with girls scoring significantly higher than boys, while there were no significant age differences,  $F(1, 518) = 0.00, p \geq 0.05, \text{partial } \eta^2 = 0.00$ . The sex by age interaction, however, was significant,  $F(1, 518) = 6.79, p < .01, \text{partial } \eta^2 = 0.01$ , indicating that sex differences in emotional intelligence were higher in adolescents than in pre-adolescents. Results about Emotional Self-Concept (CME), revealed significant sex differences,  $F(1, 518) = 10.05, p < .005, \text{partial } \eta^2 = 0.02$ , with boys scoring significantly higher than girls. No effect of age was evidenced,  $F(1, 518) = 0.00, p \geq 0.05, \text{partial } \eta^2 = 0.00$ , nor interaction age by sex,  $F(1, 518) = 1.33, p \geq 0.05, \text{partial } \eta^2 = 0.00$ . There are no significant sex differences in total score of self-rating about performance scale (AP),  $F(1,$

518) = 0.00,  $p \geq 0.05, \text{partial } \eta^2 = 0.00$ , while the age effect,  $F(1, 518) = 8.82, p < 0.005, \text{partial } \eta^2 = 0.02$ , indicate that pre-adolescents scored higher than adolescents. No interaction sex by age was evidenced for AP,  $F(1, 518) = 0.26, p \geq 0.05, \text{partial } \eta^2 = 0.00$ .

Concerning meta-emotional variables, a significant sex effect  $F(1, 518) = 4.88, p < .05, \text{partial } \eta^2 = 0.01$  in meta-emotional knowledge (CMetaAbs) revealed that boys are less accurate in estimate their performance than girls, while there are no differences between the two age groups,  $F(1, 518) = 2.07, p \geq .05, \text{partial } \eta^2 = 0.00$  nor interaction sex by age,  $F(1, 518) = 1.33, p > .05, \text{partial } \eta^2 = 0.00$ . Significant sex effect has been also found in CMetaRel,  $F(1, 518) = 24.12, p < .001, \text{partial } \eta^2 = 0.05$  revealing that only boys overestimate their performance; there are no differences between the two age groups,  $F(1, 518) = 0.4, p \geq .05, \text{partial } \eta^2 = 0.00$ , while an interaction sex by age,  $F(1, 518) = 8.16, p < .005, \text{partial } \eta^2 = 0.02$ , revealed that sex difference is higher in adolescents' than in pre-adolescents' group.

Results of meta-emotional self-evaluation (AVMetaAbs) did not evidence sex effect,  $F(1, 518) = 0.39, p > .05, \text{partial } \eta^2 = 0.00$ , nor age effect,  $F(1, 518) = 1.04, p > .05, \text{partial } \eta^2 = 0.00$ , or age by sex interaction  $F(1, 518) = 0.74, p > .05, \text{partial } \eta^2 = 0.00$ . However, when meta-emotional self-evaluation is measured in relative values (AVMetaRel) sex difference,  $F(1, 518) = 5.92, p < .01, \text{partial } \eta^2 = 0.01$ , indicate that boys overestimate more than girls their performance in the ability test. Age effect,  $F(1, 518) = 4.48, p < .05, \text{partial } \eta^2 = 0.01$ , indicate also that pre-adolescents overestimate their performance in the ability test more than adolescents, and a significant age by sex interaction,  $F(1, 518) = 5.90, p < .05, \text{partial } \eta^2 = 0.01$ , indicate that sex difference is present only for adolescents' group while scores of pre-adolescents boys and girls are almost the same.

Finally, a significant sex effect in meta-emotional beliefs (CE),  $F(1, 518) = 4.20, p = .041, \text{partial } \eta^2 = 0.01$ , indicate that girls obtained higher scores than boys, whereas no age differences,  $F(1, 518) = 0.67, p > .05, \text{partial } \eta^2 = 0.00$ , nor interaction sex by age,  $F(1, 518) = 0.03, p > .05, \text{partial } \eta^2 = 0.00$ , were found.

### 4. Discussion

Our results demonstrate that there are many differences in girls' and boys' emotional and meta-emotional intelligence and that they are also influenced by age. Even if effect sizes are small, these differences are quite systematic, and we consider them noteworthy. Consistently with previous literature (Curci & D'Amico, 2010; Cabello et al., 2016; Day & Carroll, 2004; Fernández-Berrocal et al., 2012; Gutiérrez-Cobo et al.,

**Table 2**  
Structure of IE-ACCME Test with item's content and scoring.

Dimensions		Meta-Emotional Beliefs Scale (CE)	Emotional Self-Concept (CME)	Emotional Abilities Test (AE)	Self-Rating about Performance (AP)	Meta-Emotional Knowledge (CMeta)	Meta-Emotional Self-Evaluation (AVMeta)
		Questionnaire with 5-point Likert Scale	Self-Report with 5-point Likert scale	Performance test corrected on consensus score	Self-Report with 6-point Likert scale	Calculated using the standardized scores of AE and CME	Calculated using the standardized scores of AE and AP
IE-ACCME Test	Total (Tot)	8 items <sup>a</sup>	8 items <sup>a</sup>	54 items <sup>a</sup>	8 items	(AE_Tot-CME_Tot)/AE_Tot	(AE_Tot-AP_Tot)/AE_tot
	Perception (P)						
	Faces	1 item	1 item	6 items	1 item	–	–
	Images	1 item	1 item	6 items	1 item	–	–
	Facilitation (F)						
	Use	1 item	1 item	5 items	1 item	–	–
	Sensation	1 item	1 item	15 items	1 item	–	–
	Comprehension (C)						
	Transformations	1 item	1 item	5 items	1 item	–	–
	Blends	1 item	1 item	10 items	1 item	–	–
	Management (G)						
Personal	1 item	1 item	3 items	1 item	–	–	
Interpersonal	1 item	1 item	4 items	1 item	–	–	

<sup>a</sup> Final number used for the scoring of each scale after elimination of items not fitting with the relative underlying factor during validation process. All scores of CE, CME, AE, and AP are expressed as standardized scores with mean = 100 and standard deviation = 15.

**Table 3**  
Descriptive statistics of IE-ACCME total scores and sex by age.

Scale	Age groups	Boys (n = 224)		Girls (n = 295)		Total (n = 519)	
		M	SD	M	SD	M	SD
AE	Pre-adolescents	96.69	17.41	97.21	16.86	96.96	17.11
	Adolescents	92.52	14.10	101.60	15.64	98.72	15.71
	Total	95.72	16.77	98.88	16.52	97.52	16.68
CME	Pre-adolescents	100.96	15.52	97.78	17.22	99.32	16.47
	Adolescents	102.71	15.60	95.91	13.95	98.07	14.79
	Total	101.36	15.52	97.07	16.06	98.92	15.96
AP	Pre-adolescents	103.09	14.11	103.78	13.75	103.45	13.91
	Adolescents	99.57	14.86	98.79	15.76	99.04	15.44
	Total	102.28	14.33	101.89	14.72	102.05	14.54
CMetaAbs	Pre-adolescents	0.18	0.14	0.17	0.13	0.18	0.14
	Adolescents	0.22	0.18	0.17	0.13	0.19	0.15
	Total	0.19	0.15	0.17	0.13	0.18	0.14
CMetaRel	Pre-adolescents	0.07	0.22	0.03	0.21	0.05	0.22
	Adolescents	0.14	0.25	-0.03	0.21	0.02	0.24
	Total	0.09	0.23	0.00	0.21	0.04	0.22
AVMetaAbs	Pre-adolescents	0.20	0.15	0.20	0.15	0.20	0.15
	Adolescents	0.20	0.22	0.17	0.12	0.18	0.16
	Total	0.20	0.17	0.19	0.14	0.19	0.15
AVMetaRel	Pre-adolescents	0.10	0.23	0.10	0.23	0.10	0.23
	Adolescents	0.10	0.27	-0.01	0.21	0.03	0.24
	Total	0.10	0.24	0.06	0.23	0.08	0.23
CE	Pre-adolescents	97.63	17.17	100.56	14.80	99.14	16.04
	Adolescents	98.64	15.15	102.11	15.16	101.01	15.20
	Total	97.86	16.69	101.15	14.93	99.73	15.78

Note. AE = Emotional Intelligence; CME = Emotional Self-Concept; AP = Self-Rating About Performance Scale; CMetaRel = Meta-Emotional Knowledge in relative values; CMetaAbs = Meta-Emotional Knowledge in absolute values; AVMetaRel = Meta-Emotional Self-Evaluation in relative values; AVMetaAbs = Meta-Emotional Self-Evaluation in absolute values CE = Meta-Emotional Beliefs.

**Table 4**  
ANOVA results for IE-ACCME total scores, sex and age.

Scale	Sex			Age			Sex*Age		
	F	p	Partial $\eta^2$	F	p	Partial $\eta^2$	F	p	Partial $\eta^2$
AE	8.55	0.004	0.02	0.00	0.948	0.00	6.79	0.009	0.01
CME	10.05	0.002	0.02	0.00	0.971	0.00	1.33	0.249	0.00
AP	0.00	0.973	0.00	8.82	0.003	0.02	0.26	0.609	0.00
CMetaAbs	4.88	0.028	0.01	2.07	0.151	0.00	1.33	0.250	0.00
CMetaRel	24.12	0.000	0.05	0.04	0.850	0.00	8.16	0.004	0.02
AVMetaAbs	0.39	0.531	0.00	1.04	0.307	0.00	0.74	0.389	0.00
AVMetaRel	5.92	0.015	0.01	4.48	0.035	0.01	5.90	0.016	0.01
CE	4.20	0.041	0.01	0.67	0.414	0.00	0.03	0.862	0.00

Note. AE = Emotional Intelligence; CME = Emotional Self-Concept; AP = Self-Rating About Performance Scale; CMetaAbs = Meta-Emotional Knowledge in absolute values; CMetaRel = Meta-Emotional Knowledge in relative values; AVMetaAbs = Meta-Emotional Self-Evaluation in absolute values AVMetaRel = Meta-Emotional Self-Evaluation in relative values; CE = Meta-Emotional Beliefs.

2016; Mayer et al., 1999; Mayer et al., 2002; Rivers et al., 2012) and with results already obtained by D'Amico (2013), girls score better than boys in ability-EI, and this is particularly evident in adolescent group. Results of emotional self-concept presents an opposite pattern, with boys reporting higher score than girls in both groups of age and in particular in the adolescent group and that is consistent with some studies (Khan & Bat, 2013; Petrides & Furnham, 2000). Differently from what found by D'Amico (2013), there are no sex differences in self-rating about performance scale, indicating that when specific emotional tasks are considered, boys and girls are equally accurate in evaluating own performance. However, the age-group differences in self-rating about performance indicates that, independently from sex, adolescents are more parsimonious and critics in evaluate their own performance than pre-adolescents. This is consistent with results found by D'Amico (2013) in standardization sample, indicating that scores in self-rating about performance scale were negatively related to age ( $r = -0.152, p < .005$ ). Girls show to own higher levels than boys in meta-emotional knowledge and boys systematically overestimate their emotional ability in everyday situation. This result is particularly evident among adolescents, where boy overestimate and girls underestimate their emotional abilities. In

preadolescents' group, both sexes overestimate their abilities, but again the overestimation is higher for boys than for girls.

Concerning meta-emotional self-evaluation, independently by sex, pre-adolescents overestimate their performance in the ability test more than adolescents. However, there are sex and age differences in the direction of estimation: in pre-adolescents' group, both boys and girls tend to overestimate their performance, in adolescents' group, boys overestimate and girls underestimate their performance in the ability test. Finally, consistently with D'Amico (2013) we found that girls, in both age groups, scored higher than males in meta-emotional beliefs.

These results give rise again to the famous debate on nature and culture: by evidencing that the gap among sexes is higher in older than in younger group, they seem to give more weight to the culture pole. As previously argued, probably more and more over their life, culture might influence sex difference in term of the different styles that boys and girls adopt in sharing their emotion with others: typically, women compared to men feel the need to share their problem with others. These differences in what we could define as coping strategies (coping/isolation vs. coping/sharing) are likely to be at the basis of EI differences, especially in the case of measurement tools, like MSCEIT or IE-ACCME

ability test, that are scored using the consensus criterion. As it is well known, the consensus criterion foresees that, in the ability test, the score assigned to each answer corresponds to the percentage of subjects who consider that answer valid. In other words, the “best” answers are those chosen by the largest number of subjects (i.e., the statistical mode). This procedure implies that people who obtain higher scores in emotional intelligence are not better than others but, rather, more similar to the rest of the population in the way they feel emotions. In this perspective, D'Amico (2018) defined ability EI as the ability of tuning with others or, in other word, to elaborate emotional experience like others. Thus, the tendency of little girls, teenagers and then women, to share their emotions with peers, and to listen to other's emotional issues, could generate their higher ability to tune with others, and it could be therefore the basis for this form of intelligence that is substantiated by feeling emotions like others and not differently from others. On the contrary, boys and men are probably less inclined to share emotions with others and to participate to personal and social building of emotional consensus. This could be an obstacle in developing adequate perspective taking abilities and the ability to tune with others.

As already said, the reason for many boys and men being less inclined to share their emotions with others probably stems from education and culture. Indeed, this style increases with age: on the other hand, almost in all cultures boys are expected, even as children, to be less sensitive than girls. Boys are expected not to cry, not to show or share emotions and to follow reason. On the contrary, girls are expected to follow feelings and to talk about emotions, and this expectation probably turn in a real lifelong “exercise of emotions”. However, our results seem to demonstrate that girls are not aware of their high emotional ability. Indeed, consistently with claims by Ciarrochi and colleagues, adolescent girls show an underestimation bias, since their emotional self-concept is lower than the abilities that they show in the ability test. A similar even if opposite pattern is showed by boys in adolescents' group, showing a stable overestimation bias in meta-emotional knowledge, with an emotional self-concept higher than the abilities that they show in the ability test. The same biases are observed also concerning the meta-emotional self-evaluation, with boys tending to overestimate and girls to underestimate their performance in the ability test.

In general, it seems that neither boys nor girls, with a very slight difference in pre-adolescents' and adolescents' groups, show a proper awareness of their emotional abilities. Indeed, both overestimation and underestimation reflect poor awareness of one's own emotions and may have negative effects on individual personal life. The overestimation of one's own emotional abilities might lead adolescents to copy with situation they are not able to manage; underestimation of their emotional abilities might lead them to avoid those situations that they could be able to front, reducing the experiences of success and in general their self-efficacy.

In our previous study on the relationship between emotional and meta-emotional intelligence and sociometric status (D'Amico & Geraci, 2021) we demonstrated that pre-adolescents with higher levels of ability EI, meta-emotional knowledge and meta-emotional self-evaluation are more accepted by others while those that overestimate their emotional abilities are more refused by peers. For this reason, we claimed that, for social relationships, the most “dangerous bias” in evaluating one's own emotional abilities is the overestimation. In this sense, based on our results, boys might be statistically more at risk for social rejection by peers than girl.

On the other hand, the tendency to underestimate may be likewise dangerous for girls. Indeed, we know from literature (Miao et al., 2016) that people perceiving themselves as emotional intelligent, tend to perceive general positive affect, such as feeling active, alert, and energetic at any given moment in time, whereas people who perceive themselves as poor in emotional intelligent tend to experience negative affect. Thus, on the basis of our results, girls might be statistically more at risk for negative affect and this could also help to explain, along with other neurobiological factors, the prevalence for anxiety (Jalnapurkar

et al., 2018) and depression (Labaka et al., 2018) in females when compared to males. Overestimation and underestimation errors might be also a side effect of the different degree of importance that boys and girls give to emotions in everyday life. Our results in meta-emotional beliefs seem to corroborate this view. Indeed, girls show higher scores than boys, demonstrating they own a belief's systems about emotions that is consistent with current scientific knowledge on emotional intelligence. In other words, girls believe more than boys that emotions count, and the importance given to emotions could lead girls to never consider themselves good enough in the emotional field.

#### 4.1. Limitations and future directions

We are aware that our study presents some limitation that could be overcome in future studies. Firstly, it could be useful to examine sex differences in a wider range of age groups, and in particular in younger children, in order to see if sex differences are less evident in children than in pre-adolescents. Definitely, longitudinal studies in which emotional and meta-emotional intelligence are measured during transition from childhood to adulthood may give very important insights on their developmental trend. We are also aware that this study is about sex differences and that sex does not always corresponds to gender identity and sexual orientation. For instance, the study focusing on emotional intelligence and sexual orientation realized by Míndru and Năstasă (2017), evidenced higher levels of both self-reported EI and ability EI in adults with homosexual orientation compared to those with heterosexual orientation. It is not clear to what extent this could be related to results about sex differences and, however, only one study is not enough for making clear conclusions. Moreover, due to the novelty of the paradigm, there is actually no information about meta-emotional intelligence in people with different sexual orientation. Thus, future studies should focus on differences in emotional and meta-emotional intelligence of adolescents and adults that differ not only for biological sex but also for gender identity and sexual orientation. We wonder if gender identity and sexual orientation, more than biological sex, may also predict size and direction of meta-emotional knowledge and meta-emotional self-evaluation.

## 5. Conclusions

In conclusion, our results offer new insights in literature about sex differences in emotional intelligence and may help to explain the discordances in outcomes of previous studies using self-report vs. performance measures of EI. The meta-emotional intelligence framework, indeed, may be a very useful lens for looking at the individual differences in the way males and females live their emotions. Indeed, opposite overestimation and underestimation tendencies in the two sexes may amplify the distances between the emotional world of boys and girls, probably increasing the gender conflicts, and accompanying identity or relational problems in cases of “too much sensitive” boys or “heartless girls”. Nevertheless, the statement that sex differences, at least in part, may have a cultural origin and depend also on low awareness about one's own emotional abilities and on false beliefs systems, encourage us about the possibility that, through adequate educational programs, sex difference may be mitigated and, in general, emotional and meta-emotional intelligence may be improved. In particular, these results may give important insights to professionals interested in educational programs for developing emotional intelligence, that should be focused on: a) promoting the awareness of pre-adolescents and adolescents' emotional abilities in order to reduce the possible overestimation and underestimation bias in evaluating their emotional abilities; b) stimulating, particularly in males, their habits to share emotions with others and to be attentive about their feelings; c) discussing with pre-adolescents and adolescents their meta-emotional beliefs and the cultural misconceptions about emotions.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Declaration of competing interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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