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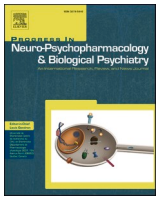

Social cognition in women with eating disorders: Differences between the restrictive and purgative profiles

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ABSTRACT

Introduction: Difficulties in interpersonal interactions have been related to Social Cognition (SC) impairments in eating disorders (EDs). However, results do not account for differences between restrictive (rED) and purgative (pED) profiles and are just based on decoding tasks. This study assessed SC by Theory of Mind (ToM) abilities in ToM decoding and inference tasks between rED and pED patients and healthy women and its relationship with clinical variables.

Method: 37 rED patients, 42 pED patients and 34 controls were evaluated using the Movie for the Assessment of Social Cognition (MASC) -ToM inference abilities- and the Reading the Mind in the Eyes revised version (RMET-R) - ToM decoding abilities-. Age, body mass index (BMI) and disorder's duration were considered as clinical variables. ANCOVA analyses were carried out to analyse differences between groups, controlling for impulsivity as a covariate. Group relationships between ToM and clinical variables were analysed through linear regression models.

Results: pED showed lower correct MASC responses ($p < .01$) and more overmentalising errors ($p < .05$) than controls, and for rED, differences overmentalising errors were close to significance ($p = .051$). For RMET-R, differences were related to impulsivity. Age ($p < .01$) and BMI $p < .05$) were related with correct MASC responses.

Conclusions: Patients with EDs show difficulties in ToM inference abilities, especially those with a purgative profile, with poorer performance related to clinical severity indices such as weight and age. Differences in ToM decoding appear to be related to impulsivity rather than clinical diagnosis.

1. Introduction

Eating disorders (ED) are severe psychiatric conditions characterised by persistent disturbance of eating-related behaviour, with disrupted food consumption that significantly impairs physical health and psychosocial functioning (American Psychiatric Association -APA-, 2022). The prevalence of ED is estimated at 0.72 %, with higher prevalence among women (Santomauro et al., 2021).

ED cause high levels of suffering and a significant reduction of quality of life for patients and their relatives, serious medical

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complications and functioning impairments. They entail high economic costs and extremely decreased well-being and the high rate of disability, suicide, hospitalisations, mortality and treatment failure among ED patients constitute a major health hazard worldwide (van Hoeken and Hoek, 2020). This highlights the urgency of improving current therapeutic interventions, implying a further identification of relevant clinical features.

Delving into specific clinical presentations of ED, huge consideration of the body shape and weight on self-evaluation is a nuclear characteristic of two disorders: Anorexia nervosa (AN) -restrictive (rAN) and purgative (pAN)- and Bulimia nervosa (BN) (APA, 2022). Although their diagnostic criteria are mutually exclusive (APA, 2022), both disorders share multiple psychopathological features and have been considered to belong to a continuum, with highly permeable diagnostic boundaries and recurrent transition between diagnoses across the lifespan (*i.e.*, Fairburn et al., 2003). From this perspective, ED can be understood as a continuum in which different diagnoses vary in symptom severity and impulsivity (Sancho et al., 2007) and due to that, two different ED profiles could be distinguished: restrictive, less impulsive, and purgative, more impulsive, characterised by binge and compensatory behaviours (Aparicio et al., 2017; Castro-Zamudio and Castro-Barea, 2015; Claes et al., 2006; Diaz-Marsa et al., 2023a; Diaz-Marsa et al., 2024a; Espel et al., 2017; Guerrieri et al., 2007; Penas-Lledo and Waller, 2001).

Beyond such great concerns about diet and body image, EDs are also characterised by impairments in interpersonal functioning (Hartmann et al., 2010), both in AN and BN (Harrison et al., 2014; Patel et al., 2016). In fact, social impairments have been highlighted in ED aetiology models and as maintainers of the disorder in different theoretical approaches (*i.e.*, Fairburn et al., 2003; Schmidt and Treasure, 2006). Bearing this in mind, interpersonal deficits may reflect an impairment on how ED patients face social life (Bora and Köse, 2016; Tauro et al., 2022).

Social environment is highly complex and unpredictable and requires higher cognitive processes to cope with a diverse social context. The processes which allow the recognition, manipulation and conduct of socially relevant information constitute Social Cognition (SC). SC abilities may guide one's behaviour in response to others and allow the construction of complex central representations of the social environment to use them flexibly to guide social behaviour (Adolphs, 1999). Specifically, one of the main components of SC is Theory of Mind (ToM), which is essential to develop an adaptative social behaviour and understanding (Green et al., 2008). Theory of Mind implies mental state attribution, and it is the ability to infer other people's mental states, considering their intentions, beliefs and emotions (Frith, 2015), by recognising mental states (ToM decoding abilities) or by interpreting mental states (ToM inference abilities).

In the light of the traditionally described impairments in social contexts of people with ED, it seems reasonable to consider SC as a potentially impaired mechanism in these disorders. Indeed, deficits in SC in patients with ED may hinder their social functioning leading to impaired interpersonal relationships (Preti et al., 2022). Impairments in SC in ED have been described in meta-analytic results (Bora and Köse, 2016; Caglar-Nazali et al., 2014; Preti et al., 2022; Simonsen et al., 2020), and they have been considered nuclear in ED psychopathology (Monteleone et al., 2020). Furthermore, SC deficits have been considered as part of the ED phenotype due to their persistence after weight recovery (*i.e.*, Corsi et al., 2021; Monteleone et al., 2020; Harrison et al., 2010b), and hypoactivation in nuclear brain areas for SC has been also described (*i.e.*, Schulte-Rüther et al., 2012). Nevertheless, SC deficits may also be influenced by other variables (Caglar-Nazali et al., 2014; Cardi et al., 2015).

However, research about SC in ED is still ambiguous nowadays, leading to contradictory results: firstly, whereas current bibliography highlights deficits in SC in ED, similar SC performance on ED patients in comparison to healthy controls (HC) has also been described in different meta-analyses and experimental studies (Cardi et al., 2015; Simonsen et al., 2020). Secondly, limited research is focused on AN (Caglar-Nazali et al., 2014; DeJong et al., 2013), and conclusions may have limited generalisation due to the lack of consistent studies on other ED profiles.

Considering the specific ED diagnoses, stronger SC deficits have been found in AN patients (Bora and Köse, 2016; Caglar-Nazali et al., 2014; Harrison et al., 2010a; Preti et al., 2022; Simonsen et al., 2020; Tapajoz Pereira de Sampaio et al., 2013). However, in the small number of studies on BN, deficits in SC have also been described (Laghi et al., 2014; Medina-Pradas et al., 2012; Rothschild-Yakar et al., 2011; Sacchetti et al., 2019). The fact that deficiencies have been found in both ED profiles, and taking into account the large difference in the study of SC between them, current results may indicate potential differences between restrictive and purgative profiles (Harrison et al., 2010a; Monteleone et al., 2020). However, results do not frequently address this issue, and AN subtypes are not usually differentiated, although assessing these differences may be crucial for a comprehensive understanding of ED deficits in SC (Preti et al., 2022; Simonsen et al., 2020).

Regarding specific SC abilities about mental states, the ToM abilities, they have been mainly assessed by recognising mental states from static pictures -decoding-, founding difficulties in patients with AN and BN (Bora and Köse, 2016; Konstantakopoulos et al., 2020; Harrison et al., 2009; Harrison et al., 2010b; Medina-Pradas et al., 2012; Preti et al., 2022; Oldershaw et al., 2010; Russell et al., 2009; Sacchetti et al., 2019). Research on the inference of mental states from complex and dynamic situations -inference- in ED is scarce, and contradictory results have been found (Brockmeyer et al., 2016; Corsi et al., 2021; Monteleone et al., 2020; Oldershaw et al., 2010).

In light of current data, no strong conclusions can be drawn about ED deficits in SC, especially regarding ToM abilities, due to a variety of reasons. Firstly, there is a lack of specification of differences between patients with restrictive or purgative ED in research results. Secondly, SC has been assessed mainly through decoding processes that are based on static information and do not capture the high complexity of social contexts. To fill these gaps, the purpose of this study is (1) to explore SC performance in ED through ToM decoding and inference tasks, distinguishing ED patients by their restrictive and purgative profile, comparing their performance to people without a psychiatric disorder. Besides, the current study also aims to (2) investigate the relationship between SC performance by ToM decoding and inference tasks and clinical variables of the restrictive and purgative disorders.

2. Method

2.1. Participants

The sample studied was formed by 113 women. The clinical group was constituted by 79 patients with an ED diagnosis, according to the DSM-5 criteria (APA, 2013). Within this clinical group, two subgroups were distinguished according to ED clinical subtypes (Aparicio et al., 2017; Castro-Zamudio and Castro-Barea, 2015; Claes et al., 2006; Diaz-Marsa et al., 2023a; Diaz-Marsa et al., 2024a; Espel et al., 2017; Guerrieri et al., 2007; Penas-Lledo and Waller, 2001) and following previous studies (Diaz-Marsa et al., 2023b; Diaz-Marsa et al., 2024a; Diaz-Marsa et al., 2024b; López-Villatoro et al., 2024; Ruiz-Guerrero et al., 2025): women with a restrictive ED -rED- ($n = 37$), with a diagnosis of anorexia nervosa without purging behaviour; and women with a purgative ED -pED- ($n = 42$), including patients with either a diagnosis of purging AN or BN.

Patients were excluded from the study if they met the following criteria: 1) had a neurological or medical illness that could affect brain functions; 2) had a neurological diagnosis associated with intellectual disabilities; 3) had a lifetime history of schizophrenia, schizophreniform disorder or bipolar disorder; 4) had a primary major depressive episode or a substance use disorder that could affect neuropsychological performance at the time of the assessment.

Patients were recruited from three public hospitals in Spain: Hospital

Clínico San Carlos (Madrid), Hospital General Universitario de Ciudad Real (Ciudad Real) and Hospital Universitario Marqués de Valdecilla (Santander). All patients were in ambulatory treatment in the Psychiatric Unit of each Hospital at the time of the assessment.

The healthy control group (HC) was comprised of 34 women with no medical or neurological disease nor any mental disorder and were recruited through advertisements on different social settings.

All participants received detailed and comprehensible information about the study procedures and objectives as well as about the voluntary nature of participation. They were encouraged to ask questions and provided explicit confirmation of their understanding and willingness to participate. No financial compensation was offered. All participants gave written informed consent prior to their participation in the research. The study was approved by the Clinical Research Ethics Committee from each of the recruiting hospitals and it was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

2.2. Assessment instruments

Socio-demographic data were collected through an *ad hoc* interview and also a clinical interview was carried out to exclude mental or physical disorders. For the clinical group, information about body mass index (BMI) and duration of the disorder was extracted from clinical history.

SC was assessed through ToM decoding and inference tasks. ToM inference abilities were evaluated with the Spanish validation (Lahera et al., 2014) of the Movie for Assessment of Social Cognition (MASC; Dziobek et al., 2006). The MASC is a videotaped instrument with great ecological validity that evaluates the ability to infer mental states, due to its contents of visual information (facial, gaze and emotions), hearing information and verbal information. The MASC is based on a 15-min film with interactions of four characters. During the test, the video is automatically interrupted by 46 questions asking about what one of the characters is thinking or feeling with four different response options for each question. This multiple-choice response allows to differentiate between correct responses (correct mental state attribution) and three different types of errors: overmentalisation errors (attributing a mental state even though there is no explanation for it), undermentalisation errors (a mental state not sufficiently attributed) and total absence of mentalisation errors (explaining social situations and mental states purely by physical attributions) (Lahera et al., 2014). The Spanish validation of the MASC (Lahera et al., 2014) had shown satisfactory psychometric properties, similar to the original version (Dziobek et al., 2006): good internal consistency with a Cronbach's alpha of 0.86, adequate test-retest reliability and sensitivity and specificity through receiver operating characteristic (ROC).

Furthermore, to evaluate ToM decoding abilities, the Reading the Mind in the Eyes Test Revised Version (RMET-R; Baron-Cohen et al., 2001) on its Spanish official translation (Baron-Cohen et al., 2016) was used. This test assesses the ability of decoding complex mental states expressed by human eyes. It consists of 36 images of facial expressions of women and men, which reflect different emotional and cognitive states through the gaze (including eyebrows). This instrument includes four answer options, with only one correct answer. The validation of the Spanish translation of the test (Fernandez-Abascal et al., 2013) shows adequate psychometric properties, with a test-retest stability through the intraclass correlation coefficient (ICC) of 0.63 for the total score ($p <$ .01). Besides, the RMET-R discriminates well between women with AN and control participants in a Spanish sample (Redondo and Herrero-Fernandez, 2018).

Lastly, impulsivity was measured with the Spanish validation (Oquendo et al., 2001) of the Barratt Impulsiveness Scale (BIS-11; Barratt, 1995). The original instrument shows a good internal consistency (Cronbach's alpha 0.79–0.83). Its Spanish validation (Oquendo et al., 2001) was used in the current study and has shown high concordance with the English version for the total score of impulsivity (proportion of agreement = 0.80).

The collection of all these data was conducted by experienced psychiatrists and psychologists.

2.3. Statistical analysis

Quantitative scores were described by means and standard deviations, qualitative variables by proportion of cases. Groups were compared across sociodemographic and clinical characteristics through analysis of variance (ANOVA), and Bonferroni correction was used for *post hoc* tests. Marital status, occupation, and educational level were compared using the χ^2 test.

To study differences between groups for ToM abilities (through responses in the RMET-R -ToM decoding abilities- and correct responses, overmentalisation, undermentalisation and absence of mentalisation errors in the MASC -ToM inference abilities-), an analysis of covariance (ANCOVA) was conducted, controlling for impulsivity as a covariate.

Finally, linear regressions were performed to analyse relationships between relevant clinical variables (age, BMI and duration of the disorder) and ToM responses (in MASC and RMET-R) in each of the clinical groups (rED and pED). For effect size estimation, Cramer's V was employed for categorical variables (small <0.2; medium 0.2–0.6; large >0.6); Eta squared (η^2) for ANOVAs and ANCOVAs analyses (small <0.01; medium 0.01–0.06; large >0.14); and *adjusted* R^2 for regression models, where 0 indicates no model fit and 1 represents a perfect model fit. All analyses were performed using IBM SPSS for MAC version 27.0.

3. Results

Sociodemographic and clinical data are described in Table 1. Between-group ANOVA analyses showed statistically significant differences in age ($F = 5.64$; $df = 2$; $p = .005$; $\eta^2 = 0.1$), BMI as expected (BMI; $F = 13.12$; $df = 2$; $p < .001$; $\eta^2 = 0.28$), occupation ($\chi^2 = 11.62$; $df = 4$; $p = .002$; $\eta^2 = 0.1$), and impulsivity ($F = 13.69$; $df = 2$; $p < .001$; $\eta^2 = 0.22$). *Post hoc* Bonferroni test indicated significant differences in age between HC and pED ($p = .004$), also in BMI between HC and rED ($p < .001$) and pED and rED ($p < .001$), and in impulsivity between HC and pED ($p < .001$) and pED and rED ($p = .004$). No significant differences were found between groups in terms of education level ($\chi^2 = 4.00$; $df = 2$; $p = .135$; $V = 0.19$), in relationship status ($\chi^2 = 5.14$; $df = 2$; $p = .076$; $V = 0.21$), nor in the duration of disorder for the rED and pED subgroups ($F = 2.03$; $df = 2$; $p = .146$; $V = 0.1$).

Differences in ToM scores between groups are shown in Table 2. In the ANCOVA test, for the correct MASC responses ($R^2_{adj} = 0.14$), it was a significant main effect of group ($F(2, 86) = 5.36$; $p < .01$; $\eta^2 = 0.11$), whereas impulsivity as a covariate was not significant ($F(1, 86) = 0.6$; $p = .441$). Also, for overmentalising errors in the MASC ($R^2_{adj} = 0.07$), it was a significant effect of group ($F(2, 85) = 4.13$; $p < .05$; $\eta^2 = 0.09$), but impulsivity was not a significant covariate ($F(1, 85) = 0.01$; $p = .758$). Results for ANCOVA analyses did not reveal significant effects of group or impulsivity undermentalising errors nor for the absence of mentalisation errors in the MASC. Finally, for the RMET-R responses ($R^2_{adj} = 0.12$), the effect of group was not significant ($F(2, 66) = 1.22$; $p = .303$), whereas impulsivity result as a significant covariate ($F(1, 66) = 4.17$; $p < .05$; $\eta^2 = 0.06$).

Examining the differences between groups by *post hoc* Bonferroni test (Table 2), significant differences between pED and HC for correct MASC responses ($p < .05$) and for overmentalising errors ($p < .05$) were found: HC participants had more correct MASC responses than pED participants, and pED participants committed more overmentalising errors in the MASC instrument than HC. Also, rED and HC groups showed marginally significant differences in overmentalising errors ($p = .051$): rED participants committed more overmentalising errors in the MASC than HC, although only at a trend level. However, no significant differences were found between clinical subgroups for the correct MASC

Table 1
Sociodemographic and clinical data.

		HC		rED		pED	
		(*n* = 34)		(*n* = 37)		(*n* = 42)	
		M	*SD*	*M*	*SD*	*M*	*SD*
Age		23.42	2.09	26.08	6.86	29.32	10.41
BMI		20.92	2.65	14.40	2.48	21.76	5.62
BMI range		(17.16–30.40)		(12.12–23.60)		(13.93–35.60)	
Disorder duration (months)		0	0	92.18	80.32	106.94	60.01
Impulsivity		26	15.39	35.55	20.12	50.98	21.68
		Frequency					
Relationship status	Single/separated	67.60 %		89.20 %		81.00 %	
	Married/in a relationship	32.40 %		10.80 %		19.00 %	
Occupation	Unemployed	14.70 %		35.10 %		21.40 %	
	Employed	17.60 %		18.90 %		40.50 %	
	Student	67.60 %		45.90 %		38.10 %	
Education	Secondary	2.90 %		16.20 %		16.70 %	
	Higher education	97.10 %		83.80 %		83.30 %	

Note. N: sample size; HC: healthy controls; rED: restrictive eating disorder; pED: purgative eating disorder*; M:* mean*; SD:* standard deviation*;* BMI: body mass index.

Table 2
Between-group differences in Theory of Mind according to ANCOVA and post hoc Bonferroni tests.

	Study group			Pairwise differences
	HC	rED	pED	
	M (SD)	*M (SD)*	*M (SD)*	
MASC correct responses	34 (4.01)	29.50 (7.46)	26.73 (7.77)	pED < HC
MASC overmentalising errors	5.29 (2.58)	7.46 (3.76)	7.70 (3.14)	HC < pED HC < rED
MASC undermentalising errors	3.68 (2.39)	4.21 (2.25)	5.11 (2.72)	
MASC absence of mentalisation errors	1.68 (1.03)	2.56 (3.48)	2.36 (1.76)	
RMET-R	25.86 (2.59)	23.47 (3.17)	22.93 (3.88)	

Note. HC: healthy controls; rED: patients with restrictive eating disorder; pED: patients with purgative eating disorder; *M:* mean*; SD:* standard deviation*;* MASC: Movie for the Assessment of Social Cognition (Dziobek et al., 2006; Lahera et al., 2014); RMET-R: Reading the Mind in the Eyes Test Revised Version (Baron-Cohen et al., 2001; Baron-Cohen et al., 2016).Finally, Table 3 shows the results of the regression analyses. All the assumptions necessary for the models were verified. As a result, no models were significant for the rED group. However, for the pED group, a regression model was significant for the correct responses on the MASC test in the pED group ($F = 5.58$, $p = .019$, *adjusted* $R^2 = 0.53$). Significant covariates for the correct responses of the MASC in pED group were age ($B = 1.19$, $SE = 0.04$, $t = 3.38$, $p = .008$) and BMI ($B = 0{,}46$, $SE = 0.15$, $t = 2.95$, $p = .016$). In other words: the more age and BMI, the better performance in the MASC test for patients with purgative ED. Lastly, linear regression models were also carried out for the different mentalising errors in the MASC test (overmentalisation, undermentalisation and absence of mentalisation) and RMET-R responses for pED group, but they were not included in the Table 3, as they were not statistically significant.

Table 3
Relationships between social cognition and clinical severity variables in the purgative eating disorder group.

MASC correct responses in pED					
	B	*SE*	C.I. 95 %	*t*	*p* value
Disorder duration	- 0.04	0.02	[− 0.09, 0.01]	−1.85	0.098
Age	1.19	0.35	[0.39, 1.99]	3.38	0.008
BMI	0.46	0.15	[0.11, 0.80]	2.95	0.016

Note. MASC: Movie for the Assessment of Social Cognition (Dziobek et al., 2006; Lahera et al., 2014); pED: purgative eating disorder; B: regression coefficient; *SE*: standard error; C.I.95 %: confidence interval at 95 %; t: Student's t-statistic; BMI: Body-Mass Index.

responses ($p = .664$), nor for overmentalising errors ($p = 1.000$).

4. Discussion

To the best of our knowledge, this is the first study to examine SC alterations through ToM abilities in a sample of ED patients differentiated by their restrictive-purgative symptomatology and comparing simultaneously their results on ToM tasks, distinguishing a more basic ToM task (mental state decoding, using the RMET-R) and a more complex one (mental state inference, using the MASC test). The results of our study showed that group differences accounted for performance in correct mental state inference, independent of impulsivity. Also, overmentalising errors differed among diagnostic groups, independent of impulsivity levels. *Post hoc* results showed that patients with a purgative ED showed large difficulties for correct inference of mental states, and they committed more wrong overattributions of mental states. In contrast, higher impulsivity scores were associated with differences in mental state decoding performance across participants through the performance on the RMET-R task, regardless of diagnostic group. Furthermore, results showed that greater difficulties in mental state inference in the pED group were associated with younger patients and patients with lower BMI.

To begin with, differences in SC between patients with ED and control subjects, showing a poor performance of ED patients in ToM tasks, are aligned with results described in meta-analyses (Bora and Köse, 2016; Caglar-Nazali et al., 2014; Preti et al., 2022; Simonsen et al., 2020).

Specifically, the profile of differences found reflects worse performance of patients with pED than HC in inferring mental states. Regarding patients with rED, our study failed to find robust significant differences between rED patients and HC in correct mental state inference. Unfortunately, to our knowledge, no previous studies compare patients with rED, pED and HC on MASC performance: the scarce studies evaluating the ToM inference abilities do not distinguish between the restrictive or purgative profile of ED patients. So, our results can be considered novel but cannot be directly compared with previous ones.

Monteleone et al. (2020), differentiating the restrictive and purgative AN subtypes and bulimia, did not find differences between them in inferring mental states, but they did not include an HC group for comparison. Corsi et al. (2021) found differences in the correct inference of mental states in ED patients in comparison to HC, in linke with the differences we found between pED and HC, but contrary to our non-differences between rED and HC. However, they did not consider the specific ED diagnosis in such comparisons, and their ED sample was composed of adolescents and adults with 38 rAN, pAN and BN. Due to that, we could not compare our specific results by ED profile and their

results considering all diagnoses together, because precisely it is the specific group which appear to influence ToM inference abilities. Lastly, Brockmeyer et al. (2016) found differences in the inference of mental states between patients with AN and HC, but regarding emotional items solely. We could not compare such results with ours, in which rED patients do not differ from HC, but pED ones -including those with purgative anorexia- differed, because they do not include BN and they do not account for AN subtypes. Considering we did not find differences between rED and HC, it is possible that our study did not have the needed sample size to detect differences, taking also into account results from Oldershaw et al., 2010, who used another highly demanding task in AN sample and also found deficits among AN patients and HC.

Furthermore, in our pED group, poorer performance in mental state inference, considering the right inference of mental states, was observed in younger patients and those with lower BMI. BMI and duration of the illness have been found to be related to SC before (Bora and Köse, 2016; Innamorati et al., 2017; Russell et al., 2009). Considering both factors together, effects of starvation or long-term starvation can be related to a worse SC performance on complex tasks (Schulte-Rüther et al., 2012).

Considering the difficulties shown by ED patients in mental state inference, current results suggest that worse comprehension of other's mental states, as previously described (*i.e.*, Bora and Köse, 2016; Caglar-Nazali et al., 2014; Preti et al., 2022; Simonsen et al., 2020) may also point to a tendency to commit overmentalisation errors: attributing a mental state even though there is no explanation for it, as is shown by MASC results. More overmentalisation errors were committed by pED patients in comparison with HC, and rED patients also showed a marginal significant difference with HC. This pattern of more overmentalisation errors in inferring mental states in ED patients have been previously described in Cortes-Garcia et al. (2021), but in the adolescent population and just considering AN and BN symptoms in the clinical sample and not people diagnosed with and ED. Also, Corsi et al. (2021) described such a pattern of inference errors for ED patients in comparison with HC, but, again, without a distinction between pED and rED profiles. Brockmeyer et al. (2016) did not find such differences for AN patients, nor Monteleone et al. (2020) comparing rAN, pAN and HC. Again, differences between current results and previous studies could emerge from group considerations. Overall, obtained results can be considered as exploratory, and future studies may analyse which specific characteristics of the rED and pED profile could influence difficulties in ToM inference abilities.

In addition, regarding overmentalisation errors, from a transdiagnostic perspective, overmentalisation is the most frequently detected mentalisation failure in patients with borderline personality disorder (BPD) (De la Higuera-González et al., 2023; Galvez-Merlin et al., 2024; McLaren et al., 2022; Sharp et al., 2011; Somma et al., 2019). Considering the clinical similarities between ED and BPD such as emotional dysregulation, impulsivity, self-harming behaviours, unstable interpersonal relationships, and also the high comorbidity rates (Mendoza et al., 2025; Shah and Zanarini, 2018) future studies should systematically compare the social cognition profiles of both groups, to detect if common characteristics are related to this specific error in attributing mental states. Such a comparison could test the hypothesis of a transdiagnostic mentalisation factor, with implications for both nosology and the development of transdiagnostic interventions aimed at enhancing socio-cognitive skills in ED and BPD patients.

To go beyond the described difficulties in inferring the correct mental states of others shown by ED patients, they could be related to a common ED altered emotional response pattern in social situations (Meneguzzo et al., 2023): ED patients have shown no increasement in positive affect in inclusion situations, but reducing negative affect in exclusion conditions. Specifically, exclusion appears to have a negative emotional impact on AN patients (Meneguzzo et al., 2023), while for BN, inclusion appear to have a negative one (Meneguzzo et al., 2023, 2025). Interpersonal situations may generate an emotional altered response which could affect inference capacities in ED patients: for rED patients, similar to similar to AN patients in Meneguzzo et al. (2023), exclusion, as an emotional situation -in which difficulties in AN patients in inference of emotional mental states have been previously described by Brockmeyer et al. (2016)-, could be a trigger for rED patients to attribute mental states when there is no reason for it, committing more overmentalisation errors about others' mental states, with the negative impact in their self-esteem and self-concept observed in Meneguzzo et al. (2023). Contrary, for pED patients, similar to those of the BN profile (Meneguzzo et al., 2023), could have a general deficit in mental state inference and also a tendency to commit more overattributing errors, which may be reflected in inferring more negative intentions to others, which could cause negative emotions also in inclusion situations (Meneguzzo et al., 2023, 2025). Taking into account that early maladaptive schemas have been described as mediators of such social situations and emotional responses (Meneguzzo et al., 2025), difficulties in interpersonal relationships have been described in ED (Fairburn et al., 2003; Schmidt and Treasure, 2006), and also, that specific difficulties in inferring emotional mental states have been highlighted as relevant for ED population (Monteleone et al., 2020), relationships between cognitive content, social situations and their link with mental states difficulties must be clarified in future studies.

Focus on decoding abilities, we found that impulsivity was associated with differences in mental state decoding, independent of diagnostic group. Again, current results on ToM decoding abilities can be considered novel but cannot be directly compared with previous ones. Due to that, considering ED subtypes differentiated due to impulsivity levels (Aparicio et al., 2017; Castro-Zamudio and Castro-Barea, 2015; Claes et al., 2006; Diaz-Marsa et al., 2023a; Diaz-Marsa et al., 2024a; Espel et al., 2017; Guerrieri et al., 2007; Penas-Lledo and Waller, 2001; Sancho et al., 2007), diverse results emerge from previous literature. Other studies described no differences between AN patients and HC in mental state decoding (Adenzato et al., 2012) nor between BN and HC (Kenyon et al., 2012); while others found differences between AN and HC (Harrison et al., 2009; Oldershaw et al., 2010; Russell et al., 2009) but others found such differences but no between BN and HC (Konstantakopoulos et al., 2020; Harrison et al., 2010a; Tapajoz Pereira de Sampaio et al., 2013). Other studies found a tendency of decreased decoding abilities in both AN and BN patients (Bora and Köse, 2016; Preti et al., 2022). Other study found differences between BN patients and HC (Sacchetti et al., 2019) and, finally, a study considering AN, BN and HC groups, found more difficulties in the BN group (Medina-Pradas et al., 2012) and no in AN. It is possible that, bearing in mind that such studies have not differentiated AN subtypes or they have not compared in most of cases AN, BN and HC, both reasons together could point out to an influence of impulsivity on results, and no of group. Beyond this hypothesis, impulsivity levels, independent of the diagnostic group could explain decoding deficits. This possibility is just speculative, and further studies must consider a differentiation of ED subgroups, and to account for impulsivity on results, if it is a variable which could differentiate ED subtypes, so is nuclear for the ED symptomatology.

All things considered, a worse comprehension of social environment can be a potential trigger for ED symptoms, considering them as a form of managing the distressful situations caused by a scarce understanding of others (Innamorati et al., 2017; Sacchetti et al., 2019) and early maladaptive schemas (Meneguzzo et al., 2025). Current studies show that an enhanced SC through therapy would improve ED symptoms (Monteleone et al., 2020; Sacchetti et al., 2019; Schulte-Rüther et al., 2012), as the mentalisation based treatment developed for ED shows promising results (Robinson et al., 2016). They highlight the therapeutic potential of SC in ED. Current results have strong implications to improve therapeutic approaches in ED: a deep understanding of SC deficits and its relationship with ED symptomatology may allow the development of tailored therapies with better results and offer protection from relapses (Schulte-Rüther et al., 2012; Tauro et al., 2022). So, addressing specific SC difficulties for each ED profile may have a great benefit in therapeutic outcomes and ED patients' quality of life.

To conclude, results should be considered in light of some limitations. Firstly, some relevant covariables such as trauma have not been considered. Trauma is a common risk factor for both ED profiles (Diaz-Marsa et al., 2024b), and it may lead to find social contexts even more distressful. It may decrease ED patient chances of interpreting and managing them appropriately (Rothschild-Yakar et al., 2011). Secondly, as a retrospective cross-sectional study, causal explanations cannot be established. Thirdly, our sample size was limited. It could have affected our results and the power of our conclusions, both in those in which we could not demonstrate significant differences, but also in which we could, our significant differences had a medium effect. Future studies must overcome this issue to obtain more robust results. Finally, ongoing treatments for patients (pharmacological treatments or psychotherapy) were not considered for the interpretation of results. It implies that conclusions should be drawn with caution, as pharmacology may have influenced results and mental state attribution capacity may have been altered due to psychotherapy treatment. Further studies should overcome these limitations.

5. Conclusions

Patients with a purgative ED appeared to present more difficulties in inferring mental states in comparison with controls, also showing a tendency for overmentalisation errors. Impulsivity appears to be related with decoding mental state attribution. In addition, younger, lower BMI and more chronic patients with a purgative ED have more difficulties in inferring mental states. Addressing SC difficulties may have a great benefit in ED therapeutic outcomes and patients' quality of life. Further research on the field is still needed for a huge comprehension of SC in ED.

CRediT authorship contribution statement

P. de la Higuera-Gonzalez: Writing – original draft, Conceptualization. **A. Galvez-Merlin:** Writing – original draft, Conceptualization. **B. Marcos-Diaz:** Writing – review & editing, Writing – original draft. **A. Calvo:** Supervision, Conceptualization. **A. Carrasco-Diaz:** Supervision, Conceptualization. **W. Ayad-Ahmed:** Methodology, Data curation. **P. Mola-Cardenes:** Methodology, Data curation. **A. de la Torre-Luque:** Supervision, Methodology. **F. Ruiz-Guerrero:** Project administration, Investigation. **F. Polo-Montes:** Project administration, Investigation. **J. L. Carrasco-Perera:** Supervision, Conceptualization. **L. Beato-Fernandez:** Funding acquisition, Conceptualization. **A. Gomez-del Barrio:** Funding acquisition, Conceptualization. **M. Diaz-Marsa:** Funding acquisition, Conceptualization.

Ethics statement

We confirm that this work is original and has not been published elsewhere, nor is it currently under consideration by another journal. Moreover, this manuscript has not been previously reviewed by this journal. All of the manuscript authors have agreed to submission of the manuscript to your leading journal in this form and authorship order. I have assumed responsibility for keeping my co-authors informed of our progress through the editorial review process.

Declaration of competing interest

None of the authors have any conflicts of interest to declare regarding the publication of this work.

Data availability

Data will be made available on request.

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