

# Anxiety as a differentiating variable in emotional recognition in juvenile offenders with high callous-unemotional traits

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## Abstract

**Background:** The presence of so-called callous-unemotional (CU) traits—lack of remorse/empathy, callous use of others and shallow/deficient affect—defines an important subgroup of children and adolescents with more severe and stable antisocial behaviours over time and may be a precursor to so-called psychopathy in adults. There are two main hypotheses to account for such traits, one emphasising deficits in recognition of specific emotions—the distress specific—and the other in aspects of facial recognition—the attention to the eyes hypothesis, but it may be that the manifestation of deficits is affected by the person's own emotional state.

**Aims:** To test the effect of anxiety scores on emotion recognition among young people high scoring for CU traits.

**Methods:** 14- to 21-year-olds serving sentences in youth justice institutions across Spain were invited to participate. Only those scoring above the cut-off on the Kimonis Inventory of Callous and Unemotional Traits were included. Anxiety was measured using the State-Trait Anxiety Inventory. Emotion recognition was assessed using the Emotional Face and Emotional Gaze Tasks.

**Results:** Of 91 (90% male) eligible participants, 53 had above threshold anxiety scores. The latter group recognised the emotional expressions of sadness, anger and fear

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earlier than their non-anxious peers, both when only the eye region was presented and when full faces were presented. There was less difference between groups in the case of the emotions of disgust and happiness, with both groups recognising these emotions earlier and more accurately when a full face was presented.

**Conclusions:** Our findings suggest that 14- to 21-year old who struggle with callous emotional traits should not be treated as a homogenous group but that testing for other relevant problems, including anxiety, may inform optimal routes to the emotion recognition training that is likely to help them relate to others more prosocially.

**KEYWORDS**

anxiety, callous-unemotional, young offenders

## 1 | BACKGROUND

The presence of 'callous-unemotional (CU) traits', that is lack of empathy or remorse, callous use of others and shallow or deficient affect, designates an important subgroup of children and adolescents with behaviour problems who present more severe and stable antisocial behaviour patterns over time than young people who do not present CU traits (Frick et al., 2005). These traits represent the main component in the psychopathy construct (Verona et al., 2013), and when they appear in young people and adolescents, research indicates that they are the precursor to the development of high psychopathy scores among adults (Kahn et al., 2012; Salekin & Frick, 2005).

Within the study of the CU component, there is more and more evidence that supports the idea that there are two well-differentiated groups—people with high CU scores and high anxiety levels and people with high CU scores along with low anxiety scores (Kahn et al., 2017). This distinction based on anxiety levels was introduced by Karpman (1941) when considering two variants of psychopathy—the primary one, related to presenting low anxiety levels, and the secondary one, related to presenting high levels of anxiety. In a longitudinal study by Kimonis et al. (2011) with young offenders, they found that those who had high scores on callous and unemotional ratings and presented with the secondary variant (higher levels of anxiety) reported more experience of child abuse, depression, hostility, reactive aggression and psychosocial distress than young people who presented the primary variant (low anxiety levels). Cecil et al. (2018) also found that a previous history of trauma can be an important variable when differentiating the two variants. They found that young offenders with high scores on CU traits and anxiety reported experiencing more severe child maltreatment, psychological distress and risk behaviours—including substance abuse, suicidal ideation and unsafe sex—than those with lower scores. The distinction between these two variants of so-called primary and secondary disorders related to high levels of callous and unemotional traits has been found in research with samples of adolescent offenders (Kimonis et al., 2011, 2012), in clinical samples (Kahn et al., 2013), and community samples of adolescents (Fanti et al., 2013), as well as between girls and boys with conduct disorder (Euler et al., 2015). In short, recent studies that relate the variables of such traits and anxiety in samples of young adolescents support the distinction indicated by Karpman (1948) and, therefore, allow for classifying young antisocial people who present very different behavioural and psychosocial patterns.

The affective dimension, specifically in emotional 'coldness', plays an important differentiating role when classifying behaviour problems, both in adult studies and in young people with psychopathy scores above a designated

threshold. Dawel et al. (2015) highlight two important theories when explaining the emotional deficits present with psychopathy—the *distress-specific* hypothesis represented by Blair (1995) with the Violence Inhibition Mechanism, and the *attention-to-eyes* hypothesis proposed by Dadds et al. (2006). Research supporting the distress-specific hypothesis shows that, in both adults and children, high psychopathy scores are associated with difficulty in processing facial expressions of fear and sadness (Blair, Colledge, et al., 2001; Blair et al., 2004), this deficit being related to a reduced response of the amygdala (Marsh et al., 2008). This deficit in processing has also been related to psychopathic characteristics in both adult forensic samples (Gillespie et al., 2015) and general community samples (Gillespie et al., 2017). This impairment implies that people with high psychopathy scores are not capable of modifying behaviour in response to these emotional cues from others and, in particular, inhibiting their violent behaviour. In the absence of recognition of distress in others, they do not experience complex moral emotions such as guilt, and they are not able to distinguish between a moral violation and a conventional violation (Blair et al., 2001).

On the other hand, the attention-to-eyes hypothesis proposes that the affective deficit of psychopathy is related to less attention to the eye region with respect to certain emotions. Research relates this deficit to the emotion of fear in young people with callous and unemotional features (Dadds et al., 2006, 2008, 2011; Halty, 2019) and in adults (Dargis et al., 2018). This deficit in gaze fixation has also been found to be related to the emotion of sadness (Billeci et al., 2019). In the case of the emotion of fear, such impairment seems to improve in subjects with high levels of CU traits when they are asked to focus their attention on the eye region (Dadds et al., 2008) and when oxytocin levels increase (Guastella et al., 2008). Within the face, the two most significant areas are the eyes and mouth, which receive more or less attention, depending on the emotion processed (Eisenbarth & Alpers, 2011). Due to the morphology of the human face (flat faces, striking nose and eyebrows that frame the eyes), the eye region is especially important in detecting a threat in another face (Whalen et al., 2004). In this sense, Fox and Damjanovic (2006) found that the eye region can transmit the threat to the same extent as the rest of the face.

Both theories (the distress-specific and attention-to-eyes hypotheses) highlight the importance of processing emotional expressions and, specifically, the importance of processing the eye region.

The aim of our study was to evaluate the effect of anxiety on emotional recognition in young people with high scores on the CU variable. Specifically, sought to compare the correct identification of facial expressions of full faces and the eye region in various emotions (happiness, disgust, fear, sadness and fear) among participants with high psychopathy scores in the primary variant (high callous and unemotional scores with low anxiety scores) and secondary variant (high callous and unemotional scores with high anxiety scores) and to test for an interaction effect between the presentation of the full faces and the eye region when we compare the anxiety scores facing different emotional expressions. Given the specific relevance of the eye region with respect to the full face, we decided to compare emotion processing between full faces and the eye region in our study. Specifically, for people with low anxiety, we expect improved emotional identification when the eye region versus the full face is presented.

## 2 | METHODS

### 2.1 | Ethics

Ethics approval was obtained from the Universidad Pontificia Comillas (Spain), and informed consent was obtained from all subjects.

### 2.2 | Participants

Young offenders serving sentences in custody were recruited from several centres of the Madrid Community Agency for the Reeducation and Reintegration of Juvenile Offenders (ARRMI) at the time of evaluation. The study was

advertised in the facility and all volunteers were screened on the Inventory of Callous and Unemotional Traits. Data collection was conducted personally by the principal investigator in a private space in the locked facility. As we were focused on the effect of anxiety on people with callous and unemotional traits, an inclusion criterion additional to offending and incarceration was a minimum score of 28 on the Inventory of Callous and Unemotional Traits (Kimonis et al., 2008). Although a cut-off of 37 was later proposed by Docherty et al. (2017), we retained the original threshold. All 91 consenting volunteers completed this inventory.

## 2.3 | Instruments

*The Inventory of Callous–Unemotional traits* (Kimonis et al., 2008) is a 24-item self-report instrument used to assess callous and unemotional traits in children and adolescents. The Spanish validation for institutionalised adolescents was performed by López-Romero et al. (2014). Participants rate items on a 4-point Likert scale from 0 (*not at all true*) to 3 (*definitely true*). Using confirmatory factor analysis, it was possible to identify three independent factors, namely: Callousness, Unemotional and Uncaring. All items were loaded onto a general callous and unemotional factor, with higher scores indicating stronger presence of these traits. The internal consistency for our study, estimated with Cronbach's alpha, was total ICU = 0.786.

*The trait anxiety subscale of the State-Trait Anxiety Questionnaire* (STAI) was used to assess propensity for anxiety (Spielberger (1983), validated in Spanish sample (Guillén-Riquelmeé & Buela-Casal, 2011). This subscale is made up of 20 items with a response format from 0 (*almost never/not at all*) to 3 (*a lot/almost always*); in our  $\alpha = 0.842$ .

*The Emotional Face Task* is a variation of the paradigm described by Blair, Colledge, et al. (2001). The stimuli used are taken from the empirically valid and reliable Pictures of Facial Affect Series (Ekman & Friesen, 1976). Participants were presented with a video in which a neutral emotional expression appears that morphs into a specific emotion—happiness, fear, anger, sadness or disgust; these descriptors are listed on the instruction sheet at the beginning. Instructions for the participants were that, as soon as they believed that they had identified the emotion into which the neutral image was being transformed, they would press the space bar of the computer, so that the video would stop, and then communicate their response aloud. They were also informed that they would not be given immediate feedback on whether or not they had correctly identified the emotion. Each face was presented to the participants on a computer screen with each stimulus subtending a horizontal visual angle of 3.6° and a vertical angle of 5.2°. A video was generated in which each of the five emotions was presented in a semi-random fashion (so that two equal emotions were not consecutive) twice (a man's face and a woman's face for each emotion), for a total of 10 faces of emotional expression. Each time the neutral image—without emotional expression—was held for 20 s and then transformed into a full representation of an emotion that lasted until the participant stopped the video to communicate his or her rating of the emotion. We included only trials in which the participant successfully recognised the emotion in the analysis, simply noting those when not. The main outcome of the study was the time needed to record recognition of the emotion accurately. We considered the proportion of correct choices as a secondary outcome.

*The Emotional Gaze Task* is similar to the emotional face task, but only the eye region is presented rather than the complete facial expression. The participant was presented with a video in which the eye region was first presented with a neutral emotional expression that then gradually changed to a specific emotion, also confined to the eye region. The participant was given the same instructions and the results recorded similarly, in terms of the number of seconds it took to recognise the emotional expression of the eye region, and the number of correct recognitions.

## 2.4 | Procedure

Each participant was evaluated in a room in private. First, the Emotional Gaze Task was presented, followed by the Emotional Face Task. Before applying each of the two tasks, the participants underwent two random emotion test

trials to ensure that they understood how to do the test. The ICU and STAI tests were administered after completion of both these tasks. Data collection took approximately 30 min for each participant.

## 2.5 | Data analysis

We analysed differences in the time to recognition and the correct choices as a function of emotion (sadness, anger, fear, disgust and happiness), type of image (complete face vs. only the eyes) and anxiety score. In the case of time to recognition, we ran a linear mixed model and a logistic mixed model for the correct choices. In all the models, the result of each trial was included as the dependent variable and subjects' identities as a random factor. All analyses were performed in the R programming language (R Core Team, 2018) by using the Lme4 packages (Bates et al., 2015) for linear models and ggplot2 (Wickham, 2016) for graphic representations. We applied a 95% level of confidence, considering differences  $p < 0.05$  as significant.

## 3 | RESULTS

### 3.1 | General description of the sample

The 91 volunteers were between 14 and 21 years old (Mean [M] = 17.50 years; SD = 1.48 years); 82 (90%) were young men and 9 (10%) were young women. Fifty-four (59%) were Spanish by birth and/or nationality and the remainder were from outside Spain. Five of these young people had been adopted (0.05%). Fifteen had offended repeatedly (16.5%).

Fifty-three of them had callous and unemotional scores above the threshold score of 28. Their demographic and offending status was similar to that of the larger group (47, 89% male). Their mean age was 17.5 years (SD = 1.5, range 14–21). Over half (29, 55%) were born in Spain. A larger group, however, were recidivists (31, 59%). With regard to type of offence, 30 (57%) were convicted of assault, 8 (15%) for attempted homicide or homicide and 25 (47%) for theft. Three of this group had been adopted and nine (17%) were under state guardianship.

Among the 53 young people with above threshold scores on callous and unemotional traits, the mean anxiety score was 29.6 (SD = 10.2; range 12–51).

### 3.2 | Emotional recognition among the participants with high callous and emotional trait scores

Table 1 shows the mean time to recognition and proportion of correct choices as a function of the emotion and type of image. As might be expected, considering the greater difficulty in recognising emotions with images of the eyes than with whole faces, the number of correct choices appears consistently lower on eye rather than full face tests, but there are no significant differences. Differences in time to recognition are, however, more varied—clearer with respect to happiness and disgust than for anger, fear or sadness.

### 3.3 | Emotional recognition among the participants with high callous and emotional trait scores according to anxiety ratings

Low anxiety was associated with a faster recognition of *sadness* in eye images, while high anxiety participants recognise sadness faster in face images ( $F(1, 278.1) = 5.157; p = 0.024$ ). Variation was mainly accounted for by

**TABLE 1** Mean time to emotion recognition and proportion of correct choices as a function of the emotion and type of image among young offenders with high callous and unemotional traits ( $N = 53$ ).

	Face		Eye	
	Mean	SD	Mean	SD
<b>Time to recognition</b>				
Anger	15.9	3.7	15.8	3.9
Disgust	14.7	3.5	17.0	3.5
Fear	15.4	3.8	15.7	3.7
Sadness	16.8	3.7	15.9	3.8
Happiness	11.8	3.6	15.5	4.1
<b>Proportion of correct choices</b>				
Anger	0.86	0.12	0.76	0.18
Disgust	0.78	0.17	0.33	0.22
Fear	0.95	0.05	0.81	0.15
Sadness	0.90	0.09	0.84	0.13
Happiness	0.99	0.01	0.81	0.15



**FIGURE 1** Relationship between anxiety and time to recognise each emotion as a function of the type of picture presented (sadness, anger, fear, disgust and happiness).

type of image (main effect type of images;  $F(1, 279.6) = 9.949$ ;  $p = 0.002$ ; main effect anxiety  $F(1, 51.1) = 0.253$ ;  $p = 0.617$ ; Figure 1a). With respect to whether participants made the correct judgement of emotion, we found a non-significant interaction in the same direction ( $Z = 1.872$ ;  $p = 0.0612$ ). Individuals with CU-low anxiety recognise the sadness emotion in eye images better, while people with CU-high anxiety recognise sadness better in face images (main effect of type of image,  $Z = 1.219$ ;  $p = 0.223$ ; main effect of anxiety,  $Z = -0.485$ ;  $p = 0.627$ ; Table 2).

In the case of *anger*, we also found an interaction between type of image and anxiety in the time to recognition ( $F(1, 272.7) = 4.123$ ;  $p = 0.043$ ), although the direction of effect was less clear here (main effect of type of images  $F(1, 272.4) = 0.852$ ;  $p = 0.357$ ; main effect of anxiety  $F(1, 48.7) = 0.103$ ;  $p = 0.750$ ). People with low anxiety recognise anger more quickly in eye images, while people with high anxiety recognise anger more quickly in face images (Figure 1b). In the case of correct choices, we again found a non-significant interaction in the same direction ( $Z = 1.923$ ;  $p = 0.0545$ ). Individuals with low anxiety are more likely to recognise anger in eye images, while people

TABLE 2 Differences in time to correct choices between face and eye images per each emotion as a function of anxiety level.

	Anxiety		
	Low	Medium	High
Sadness	0.00	0.04	0.17
Anger	0.06	0.03	0.27
Fear	0.03	0.15	0.26
Disgust	0.45	0.33	0.55
Happiness	0.17	0.11	0.32

Note: A positive value points to a better performance in face images.

with high anxiety recognise anger better in face images (main effect of type of image,  $Z = -1.846$ ;  $p = 0.065$ ; main effect of anxiety,  $Z = -1.278$ ;  $p = 0.201$ ; Table 2).

In the case of *fear*, we found an interaction between the type of image and anxiety in time to recognition ( $F(1, 313.3) = 6.703$ ;  $p = 0.010$ ), again with relative importance of image or anxiety less clear (main effect of type of images  $F(1, 311.9) = 0.489$ ;  $p = 0.484$ ; main effect of anxiety  $F(1, 52.4) = 0.078$ ;  $p = 0.782$ ), but a suggestion that faster recognition of fear in eyes is associated with low anxiety, while people with high anxiety recognise fear more quickly in faces (Figure 1c). With respect to correct choices, we also found an interaction, this time a significant one ( $Z = 2.252$ ;  $p = 0.024$ ). While in individuals with low anxiety there were no differences in successful recognition of face or eye images, individuals with CU-high anxiety were more likely to identify fear correctly in face images (main effect of type of image,  $Z = 3.398$ ;  $p = 0.001$ ; main effect of anxiety,  $Z = -1.463$ ;  $p = 0.143$ ; Table 2).

In the case of *disgust*, we again found an interaction between type of image and anxiety in terms of time to disgust recognition ( $F(1, 202.2) = 30.477$ ;  $p < 0.001$ ), but with no clear indication of whether image type ( $F(1, 207.7) = 2.723$ ;  $p = 0.100$ ) or anxiety ( $F(1, 51.3) = 0.153$ ;  $p = 0.697$ ) were behind this. In the case of correct choices, we found a clearly better performance on face images throughout ( $Z = -6.645$ ;  $p < 0.001$ ) but again without indication of main effect (image type  $Z = 1.124$ ;  $p = 0.261$ ; anxiety  $Z = -0.441$ ;  $p = 0.660$ ).

Finally, in the case of *happiness*, we found a reduced response time on face images ( $F(1, 317.2) = 118.891$ ;  $p < 0.001$ ), without interaction with anxiety ( $F(1, 319.4) = 0.047$ ;  $p = 0.828$ , nor anxiety main effect,  $F(1, 50.5) = 0.002$ ;  $p = 0.962$ ). In the case of correct choices, we found a better performance on face than eye images ( $Z = -3.283$ ;  $p = 0.001$ ) and a negative effect of anxiety on performance, albeit without anxiety as a main effect ( $Z = -2.415$ ;  $p = 0.016$ ) or as an interaction variable ( $Z = -1.008$ ;  $p = 0.314$ ; Table 2).

Figure 1 and Table 2 show how anxiety moderates the effect of the type of image on the recognition of emotions. In Figure 1, we can see that as anxiety increases, the difference needed more time to recognise eye images in comparison with faces images, in the case of emotions of sadness, anger, fear and disgust. Table 2 shows differences on correct judgements when evaluating emotions from eye or face images. It can be seen then as anxiety increases, these differences are larger favouring judgements of face images, in the case of emotions of sadness, anger and fear. Results point out that, in our sample of high CU, emotional recognition, at least in some emotions, increases when focalising attention to the eyes region, but only when anxiety is low.

## 4 | DISCUSSION

Two explanatory theories of the emotional deficit in psychopathy (the distress-specific hypothesis; Blair, 1995) and the attention-to-eyes hypothesis (Dadds et al., 2006) were related to likely variables underpinning callous and unemotional traits in this study. We compared the reaction times and number of correct emotion identifications in a group of young people with high callous and unemotional traits but various levels of anxiety.

Our results indicated that young people with high callous and emotional trait ratings and low levels of anxiety recognised the emotional expressions of sadness, anger and fear more quickly when only the eye region was presented. Generally, those with high levels of anxiety recognised emotional expressions earlier when full faces were presented, although the extent to which this was true varied with the emotion presented. In the cases of disgust and happiness, young people recognised emotions from full faces earlier than from the eye region alone and were more accurate when the full face was presented. This is, perhaps, to be expected considering that the area of the mouth in these emotions is the most salient stimulus, perhaps due to the rather unique shape of a smile, or the frowning of the nose and the mouth for disgust (Elsherif et al., 2017; Schurgin et al., 2014).

Regarding the identification of the emotional expression of fear in subjects with high levels of CU and low scores in anxiety, our data are consistent with the results of Dadds et al. (2008). They found that, if people with psychopathy characteristics were forced to focus their attention on the eye area to detect expressions of fear, their identifications improved. We found the same with the emotional expression of sadness and anger in our study. Both emotions, like fear, are represented with more intensity in the eye area (Eisenbarth & Alpers, 2011; Wells et al., 2016). The eye region contains enough information to detect some complex mental states in another person (e.g., guilt and flirtation), suggesting that the eyes have their own language (Fox & Damjanovic, 2006). Recent investigations have shown a deficit of attention to the eye region in people with psychopathy in the face of emotional expressions of sadness, fear, or anger (Billeci et al., 2019; Dargis et al., 2018; Gillespie et al., 2017; Menks et al., 2021), which could explain the difficulties they have in recognising these emotions. It is perhaps not surprising that by requiring our research participants to focus their attention on the eye region in the emotional expressions of sadness and anger, they also improved their identifications.

In summary, our results support both the hypotheses of Blair (1995) and Dadds et al. (2006). Findings from a task that requires people with high callous and unemotional traits but also low anxiety to focus their attention on the eye region to identify emotional expressions of fear, sadness and anger, suggest that, in everyday interpersonal interaction, outside of the controlled research context, they do not usually pay attention to the elements of the face that are crucial in identifying the emotions of the other. Thus, the mechanisms of inhibition of violence proposed by Blair, Colledge, et al. (2001) are not activated in their brain. This deficit displays a cascade of negative consequences that can lead to these individuals lacking empathy and thus, potentially, being more aggressive.

## 4.1 | Limitations

Inevitably, our research has some limitations. First, it would have been desirable to be able to compare the scores on the study variables with young people who are not serving a sentence in a correctional institution, in other words, a true control sample. Second, it would have been ideal to add an eye-tracking technique, to check the duration of actual gaze and more accurately determine actual attention to the zones of the face and eye regions. Thirdly, it would have been interesting to evaluate the differences in the interaction between anxiety and the type of stimulus for the different emotions but, given the small sample size, the test of the triple interaction effect would not have had sufficient power.

## 5 | CONCLUSIONS

In a sample of young offenders with high callous and emotional traits as rated on the Kimonis et al. Inventory of Callous–Unemotional Traits, we found some important differences in both accuracy and time taken to identify emotional expressions in the context of reported anxiety. This has important implications for treatment, suggesting different strategies may be necessary in treatment of young offenders who get a label of 'psychopathy' or have measured high levels of such traits.



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## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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