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ORIGINAL ARTICLE

Emotion Identification for Self and Other Associated with Callous-Unemotional Traits and Sex Differences in Early Adolescents

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Abstract
Callous-unemotional traits (CU) associates with impairments in emotional responsivity. However, there is less evidence on associations with specific emotions and sex differences utilizing both self and other oriented emotional stimuli. Given that the nuance of associations with specific emotions (including sex effects) is critical for understanding core impairments of this antisocial phenotype, the current study employed a behavioral paradigm with both self and other emotional stimuli for specific emotions (happy, sad, anger, fear, neutral) with a sample of male and female early adolescents (females = 51%, age = 12.86 ± 0.75). We examined accuracy and reaction times on this task, along with moderating effects of sex, in relation to CU traits. Results indicate CU traits associated with overall self-emotions negatively and sex moderated CU traits negative association with recognizing others overall emotions. CU traits negatively associated with accurate identification of both self and other emotions (happy, sad, and fear). Sex moderated all other emotion identification but only sad emotions for self. No reaction time differences were found. These findings evidence important nuance in CU traits and sex effects with identifying self and other emotions. Results have important implications for clinical understanding of sex differences in CU traits that require further consideration.

Keywords Callous-unemotional traits · Adolescents · Emotion identification · Perspective taking

Introduction

CU traits describe the profound affective impairments of psychopathy such as a shallow affect, lack of empathy, and low responsiveness to others emotional cues [1] that have a genetic influence and are observable in youth [2, 3]. Youth with CU traits are differentiated from those with conduct problems because of profound interpersonal and socio-affective impairments [4]. Accordingly, developmental models of psychopathy have focused on CU traits, included in the DSM 5 under the "low prosocial emotion" specifier [5], and have targeted the fundamental risk pathway of hypo-responsiveness to others' emotions [6–9]. Emotion identification impairments associated with CU traits have largely centered around a lack of fear identification as a fundamental feature [6, 8, 10, 11], but these emotion identification impairments appear to be generalizable across other emotions such as happiness and sadness [12]. These impairments are present for emotion identification in both self and others but is more consistent when identifying other's emotions (for review: [13].

Although emotion identification has a demonstrated impairment in those at higher CU traits, there are critical gaps that prevent understanding emotion processing as a fundamental risk pathway for development of psychopathy. For example, evidence for self and other oriented emotion identification comes from self-report studies [14] that could be improved by direct measurement in behavioral paradigms. Studies that measure behavior primarily examine general emotional valence (e.g., positive, negative, neutral) without specific emotions (for review: [13]. Moreover, most of the available literature in this line of research focus primarily on boys without adequate samples to detect sex effects (for review: [13]. Effects of CU traits on emotion identification also comprise important subscale associations [12] that could be better understood

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by examining sex effects and self and other emotion identification. These nuances are critically important for understanding emotion identification deficits associated with CU traits that still need tested.

The present study advances research on emotion identification impairments in CU traits by using a behavioral paradigm that includes both self and other oriented emotion identification with a sample of early adolescents with adequate numbers of males and females. Given prior findings on specific emotions, we hypothesized that CU traits will associate with impairments in recognizing happiness, sadness, and fear in both self and other conditions. Moreover, because of demonstrated sex differences in emotion identification [15], we hypothesize that all effects will be moderated by sex. Also, because the callousness dimension of CU traits is a central component [16] that represents a lack of concern for others emotions [17], we hypothesize that the callousness subscale will be the primary driver of significant associations between CU traits and emotion identification. Such findings would reveal important nuance in the association between CU traits and emotion identification deficits that could elucidate differences in risk pathways for development of psychopathy.

Methods

Sample

The Colorado Multiple Institutional Review Board approved all study materials including the protocol, recruitment strategy, and consents/assents. All participants completed both consent (parent/guardian) and assent (child). Consent required a responsible adult to upload identification. Participants that applied to the study were selected based on age (12–14 years) and meeting recruitment numbers involving equal numbers across sex and CU traits (high and normative). Assessing for high CU traits involved nine-items on the inventory of callous-unemotional traits along with split-item method of scoring (i.e., the low prosocial emotion specifier; [18, 19]. Participants were excluded if they did not meet inclusion criteria or if they did not complete the consent and assent process after a follow up. Participants that met criteria were excluded if they did not complete within a month. We recruited a total of 87 adolescents (ages 12–14: 12.86 ± 0.75) that were relatively balanced between sex (female 51%, male 49%), mostly White (White = 68.9%, Black = 16.1%, Pacific Islander = 10.3%, American Indian = 1.2%, Asian = 1.2%, other race = 2.3%) with 16.1% reporting Latinx ethnicity, and a marginally higher number of participants qualified for high relative to normative CU traits (high CU = 57%, normative CU = 43%).

Measures

Callous-Unemotional Traits

CU traits was assessed using the Inventory of Callous-Unemotional Traits (ICU; [17]. While the measure has a total of 24 items, previous research demonstrates two items on the ICU have poor psychometric properties and were removed from our analyses [18]. In the current sample, this measure demonstrated adequate reliability ($\alpha = 0.78$). This measure includes subscales for dimensions of CU traits including callousness (e.g., "I do not care who I hurt to get what I want"), uncaring (e.g., reverse scored: "I care about how well I do at school or work"), and unemotional (e.g., "I do not show my emotions to others"). Participants rated each item from "not true at all" (0) to "definitely true" (3). Higher CU traits are indicated by higher scores.

Self and Other Emotion Identification

Self and other emotion identification was assessed using the perspective taking task developed by Choudhury et al. [20]. This task involves the presentation of 120 scenarios where participants are asked to imagine either how they themselves (e.g., "you are not allowed to go to your best friends party") or another would feel (e.g., "A girl is not allowed to go to her best friends party") and respond to either how they would feel, or another would feel in that scenario (respectively). Responses involve selecting one of two cartoon emotional faces. Emotional faces were used so that verbal ability did not affect response time. There was a total pool of five cartoon emotional faces with emotions of happy, sad, scared, angry, and neutral. For each presented scenario one response is correct and the other is incorrect. Questions were delivered in blocks of 30 questions in a pseudorandom order that was counterbalanced between participants. Each block of questions took approximately two minutes. Prior to starting the task, three practice questions were completed prior to the task that included instructions and feedback to ensure they paid attention to the self or other emotion identification. The task measures were collected for overall as well as individual emotions for both self and other conditions that included (1) reaction time in milliseconds between presentation of the faces and key press, (2) accuracy of response, and (3) differences between self and other condition (3a) reaction time and (3b) accuracy.

Additional Variables and Covariates

Careless Respondents

Responses to questionnaires that are highly patterned suggest participants that respond carelessly. We detected highly

patterned responses using the R package 'careless' [21]. The level of carelessness was identified to prevent spurious associations by regressing out variation due to careless responses. We assessed for carelessness by quantitating multiple sources of carelessness across three metrics. The first was long-string, or the length of successive repetitious responses (i.e., how many trials the same response was pressedl; [22]. Second was item-variability, or how much the response varied (i.e., quantitating variability of question responses with low variability suggesting carelessness; [23]. The third was even–odd, or the similarity between even and odd responses (i.e., consistency of responses between even and odd numbered questions with greter consistency suggesting carelessness; [22].

To identify extremely careless responses, we used the median and median absolute deviation (MAD). The MAD is not strongly affected by data outliers or sample size, and is more effective than other approaches (e.g., interquartile range and standard deviation) at detecting outliers [24]. We used a highly conservative criteria of MAD*3 [24] that involved criteria of median – MAD*3 for item-variability of and median + MAD*3 for both long-string and even–odd. This variable was then used to regress out careless responses and improve parameter estimation.

Inattentive Participants

Next, we identified, and removed, participants that had extreme levels of inattention during emotion identification task. Using the reaction time for the emotional identification task, we identified participants that took an extremely long time completing the task using median + MAD*3 or those that pressed buttons without reading the material using median – MAD*3. We then removed these participants to ensure results didn't reflect extreme inattention to the task.

Conduct Problems

The Strengths and Difficulties Questionnaire (SDQ; [25, 26] was used to assess conduct problems. The SDQ is a behavioral screening that demonstrates cross-informant correlation, internal consistency, and test–retest reliability [26, 27]. Five items comprise the subscale for conduct problems, which, in the current sample, demonstrates adequate reliability ($\alpha = 0.86$). Items such as "I take things that are not mine from home, school or elsewhere" are rated by participants on a scale of 0 ("not True") to 2 ("Certainly True"). Higher conduct problems are indicated by higher scores.

Covariates

We controlled for sex, age, conduct problems, and careless responses. Sex was controlled for because of its association with CU traits (e.g., [28] and emotion identification [15]. Age controlled for to regress out any age-related differences in emotion identification [29]. Given the relationship of most relevance and interest is CU traits association with emotion identification, we controlled for conduct problems to retain the signal of CU traits independent of co-occurring conduct problems. Given that there were no changes because of modeling conduct as a covariate and no concerns for suppression effects (e.g., [30, 31] we only report on models that control for conduct problems. We did not control for race because the task involved worded scenarios that do not introduce bias due to identifying emotions of another outside their racial background (e.g., [32] and CU traits is not explained by racial background [33], thus we had no reason to believe race would confound one's ability to identify emotions.

Analysis

A Priori Power Analysis

Using the r package 'pwr' [34], a priori power analysis was conducted on the association between CU traits and the emotion identification task. Emotion identification impairments in CU traits have up to moderate effect sizes [35] and the emotion identification task we used is anticipated to have a large effect size [20]. Given the variance in related study effect sizes, we assumed a moderate effect size to determine an adequate sample size. Using a two-tailed test, $F^2 = 0.25$, and alpha of 0.05 suggested we needed 65 participants to achieve 80% power.

Preliminary Assessment

We found no violations to multicollinearity, normality of residuals, auto correlation, and linearity. Moreover, there were no missing data in our sample. Thus, we designed our analytic approach without needing to account for non-normality, non-linear associations, or missing data.

Analytic Approach

We conducted analyses to examine CU traits association with (1) considering all emotions self and other emotion identification accuracy and reaction times, (2) considering all emotion differences between self and other emotion identification accuracy and reaction time, and (3) considering individual emotions separately (happy, sad, angry, scared, neutral) identification accuracy and reaction time. For each of these analyses, we tested for sex effects by including a moderating term for CU traits *sex what was orthogonalized from the model using the residualized centering approach suggested by Little et al. [36] implemented with the 'semtools' package [37]. All study hypotheses were

tested with path analyses using 'lavaan' [38] with maximum likelihood estimation. This approach improves confidence in model estimates by 1 reducing the number of models needed to estimate due to modeling multiple dependent variables in one model (i.e., reducing type II error while also two accounting for shared associations between identification of self and other's emotions. We bootstrapped all parameters including interaction terms with bias corrected 2000 resamples,and p-values are based on these bootstrapped results.

Results

Sex Moderates CU Traits Associate with Self and Oher Emotion Identification

Higher CU traits associates with less accuracy across all emotions for self (std $\beta = -0.33$, $p = 0.009$) and sex moderates CU traits association with less other emotion identification accuracy (std $\beta = -0.33$, $p = 0.016$, Fig. 1, Table 1). For identifying other's emotions, males have lower accuracy (std $\beta = -0.60$, $p = 0.002$) whereas females have no statistically significant change (std $\beta = -0.22$, $p = 0.063$). Moreover, the association between self and other emotion identification was significant as expected (std $\beta = -0.59$, $p < 0.001$). Conduct problems associations with outcomes of interest were not significant. The only control variable that significantly associated was being a male for self-emotion identification (std $\beta = -0.23$, $p = 0.027$). However, reaction times were not significantly different nor significant differences in accuracy between self and other emotions (Supplementary Tables 1–3).

Specific Emotion Accuracy Lower at Higher CU Traits and Some Moderated by Sex

For self-emotion accuracy, higher CU traits directly associated with lower happy (std $\beta = -0.36$ $p = 0.003$) and scared (std $\beta = -0.32$, $p = 0.012$), and sad identification and this association was moderated by sex (std $\beta = -0.41$, $p < 0.001$, Fig. 2, Table 2). For other emotion identification, sex moderated higher CU traits association with lower happy (std $\beta = -0.39$, $p = 0.027$), sad (std $\beta = -0.26$, $p = 0.048$), and scared identification (std $\beta = -0.29$, $p = 0.029$, Fig. 3, Table 2). For all interaction slopes, both males and females were significantly negative except recognizing sad emotions in others was significantly negative for males but insignificant for females (Table 2). For control variables, being a male negatively and directly associated with identifying happiness and sadness in self, and careless responses associated negatively

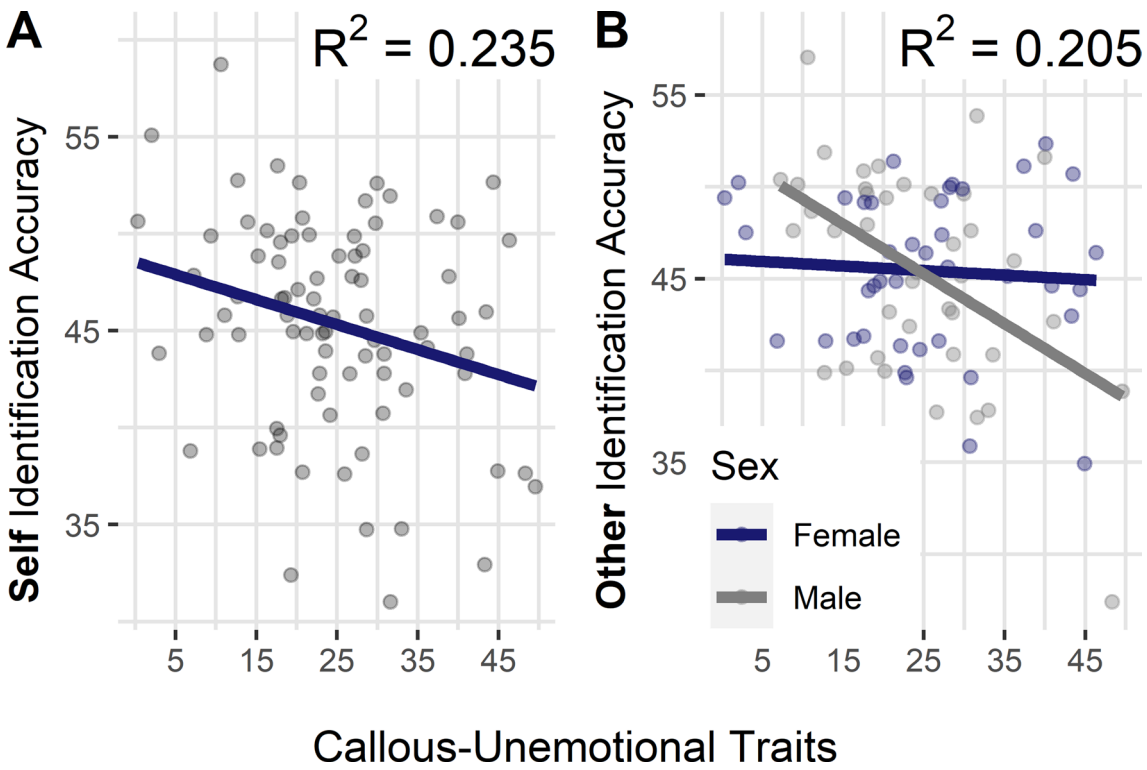

Fig. 1 Depicting interaction between CU traits and sex on emotion identification accuracy across all emotions. **A** depicts self-emotion identification whereas **B** depicts other emotion identification

Table 1 Self and other emotion identification across all emotions associating with CU traits

	β	SE	Std β	Z	p-value	Bootstrapped 95% CI	
						Lower	Upper
Accuracy in self ~ ($R^2 = 0.235$)							
CU*sex	− 0.341	0.215	− 0.187	− 1.585	0.113	− 0.763	0.099
CU	− 0.300*	0.114	− 0.329	− 2.626	0.009	− 0.523	− 0.078
Age	0.502	0.768	0.066	0.654	0.513	− 1.043	2.041
Sex	− 2.681*	1.212	− 0.234	− 2.213	0.027	− 5.110	− 0.434
Careless	− 2.122	2.075	− 0.139	− 1.022	0.307	− 6.495	1.621
Conduct	− 0.026	0.590	− 0.007	− 0.044	0.965	− 1.204	1.120
Accuracy in others ~ ($R^2 = 0.205$)							
CU*Sex	− 0.519*	0.215	− 0.327	− 2.416	0.016	− 0.949	− 0.109
CU	− 0.307*	0.116	− 0.387	− 2.656	0.008	− 0.534	− 0.074
Age	0.771	0.657	0.116	1.175	0.240	− 0.417	2.086
Sex	− 0.321	1.114	− 0.032	− 0.288	0.773	− 2.503	1.872
Careless	− 0.480	1.653	− 0.036	− 0.290	0.772	− 3.531	3.046
Conduct	0.552	0.444	0.175	1.245	0.213	− 0.298	1.421
Interaction effect of sex							
Male	− 0.826*	0.269	− 0.714	− 3.070	0.002	− 1.345	− 0.307
Female	− 0.215	0.116	− 0.215	− 1.857	0.063	− 0.442	0.018

Bootstrapped confidence intervals are bias corrected with 2000 resamples, p-value bootstrap-based p value, *bootstrap-based $p < 0.05$

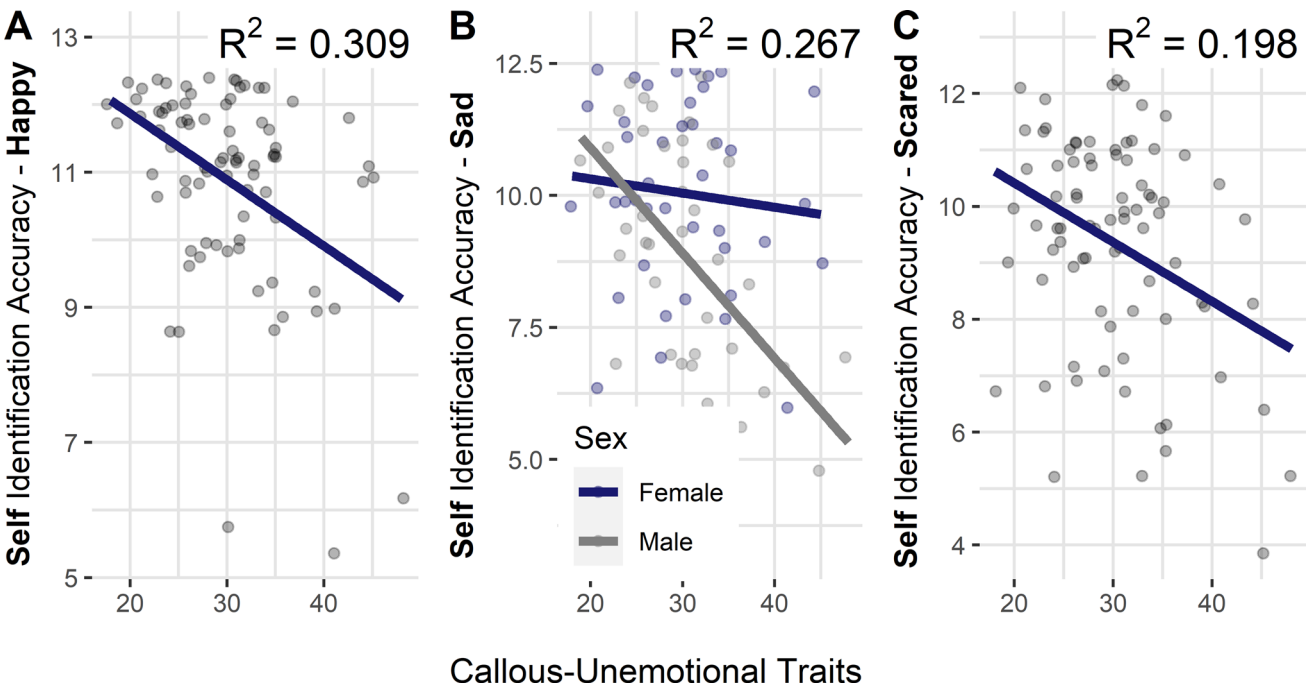

Fig. 2 Depicting self-emotion identification accuracy for individual emotions association with CU traits. **A** depicts happy self-identification. **B** depicts sad self-identification and CU traits interaction with sex. **C** depicts scared self-identification

with identifying happiness and fear in self. Importantly, conduct problems did not significantly associate with any emotions (Table 2). Reaction times for individual emotions were not significantly different for any individual emotion (Supplementary Table 4).

CU Traits Subscales Drive Associations with Emotion Identification

For overall self and other accuracy, the uncaring subscale underlies CU traits association with self-accuracy and other

Table 2 Individual emotions accuracy for self and other emotion identification association with CU traits

	β	SE	Std β	Z	p-value	Bootstrapped 95% CI	
						Lower	Upper
Emotion identification in self							
Happy in self ~ ($R^2 = 0.309$)							
CU*sex	− 0.028	0.052	− 0.063	− 0.540	0.589	− 0.119	0.084
CU	− 0.081*	0.027	− 0.360	− 3.007	0.003	− 0.140	− 0.034
Age	− 0.016	0.185	− 0.009	− 0.087	0.931	− 0.388	0.318
Sex	− 0.532	0.274	− 0.188	− 1.939	0.053	− 1.077	− 0.013
Careless	− 0.995	0.488	− 0.264	− 2.040	0.041	− 2.108	− 0.175
Conduct	− 0.066	0.106	− 0.074	− 0.626	0.531	− 0.267	0.135
Angry in self ~ ($R^2 = 0.042$)							
CU*sex	− 0.040	0.084	− 0.061	− 0.478	0.632	− 0.197	0.127
CU	0.051	0.043	0.157	1.203	0.229	− 0.040	0.129
Age	0.141	0.277	0.051	0.508	0.612	− 0.444	0.656
Sex	− 0.023	0.470	− 0.006	− 0.049	0.961	− 0.940	0.902
Careless	0.328	0.664	0.060	0.494	0.621	− 1.145	1.479
Conduct	− 0.242	0.190	− 0.185	− 1.271	0.204	− 0.606	0.135
Sad in Self ~ ($R^2 = 0.267$)							
CU*sex	− 0.188*	0.062	− 0.279	− 3.059	0.002	− 0.309	− 0.066
CU	− 0.138*	0.034	− 0.409	− 4.081	0.000	− 0.202	− 0.064
Age	− 0.094	0.282	− 0.033	− 0.335	0.738	− 0.664	0.430
Sex	− 1.282*	0.434	− 0.302	− 2.955	0.003	− 2.150	− 0.431
Careless	− 0.191	0.691	− 0.034	− 0.277	0.782	− 1.456	1.256
Conduct	0.212	0.187	0.158	1.133	0.257	− 0.186	0.557
Interaction effect of sex							
Male	− 0.326	0.067	− 0.689	− 4.849	< 0.001	− 0.426	− 0.181
Female	− 0.138	0.034	− 0.409	− 1.080	< 0.001	− 0.202	− 0.064
Scared in self ~ ($R^2 = 0.198$)							
CU*sex	− 0.028	0.077	− 0.047	− 0.369	0.712	− 0.182	0.124
CU	− 0.097*	0.039	− 0.320	− 2.499	0.012	− 0.173	− 0.020
Age	0.097	0.284	0.038	0.343	0.732	− 0.449	0.663
Sex	− 0.695	0.415	− 0.182	− 1.673	0.094	− 1.519	0.118
Careless	− 1.085*	0.498	− 0.214	− 2.177	0.030	− 2.093	− 0.084
Conduct	0.012	0.155	0.010	0.076	0.940	− 0.299	0.310
Neutral in self ~ ($R^2 = 0.055$)							
CU*sex	− 0.056	0.074	− 0.108	− 0.762	0.446	− 0.198	0.091
CU	− 0.035	0.039	− 0.136	− 0.916	0.360	− 0.121	0.035
Age	0.375	0.240	0.172	1.557	0.119	− 0.083	0.867
Sex	− 0.149	0.406	− 0.045	− 0.366	0.714	− 0.953	0.613
Careless	− 0.178	0.664	− 0.041	− 0.268	0.788	− 1.626	0.962
Conduct	0.058	0.179	0.056	0.327	0.744	− 0.266	0.425
Emotion identification in others							
Happy in others ~ ($R^2 = 0.278$)							
CU*sex	− 0.147*	0.064	− 0.342	− 2.299	0.021	− 0.271	− 0.019
CU	− 0.085*	0.038	− 0.397	− 2.217	0.027	− 0.155	− 0.007
Age	− 0.065	0.172	− 0.036	− 0.378	0.705	− 0.431	0.253
Sex	− 0.442	0.279	− 0.164	− 1.589	0.112	− 1.021	0.066
Careless	− 0.038	0.417	− 0.011	− 0.091	0.928	− 0.983	0.698
Conduct	0.022	0.116	0.026	0.190	0.849	− 0.205	0.239
Interaction effect of sex							

Table 2 (continued)

	β	SE	Std β	Z	p-value	Bootstrapped 95% CI	
						Lower	Upper
Male	− 0.232	0.097	− 0.739	− 2.399	0.016	− 0.407	− 0.033
Female	− 0.085	0.038	− 0.397	− 2.216	0.027	− 0.155	− 0.007
Angry in others ~ (R^2 = 0.052)							
CU*sex	0.000	0.066	0.001	0.006	0.995	− 0.130	0.129
CU	− 0.019	0.037	− 0.065	− 0.509	0.610	− 0.083	0.060
Age	0.452	0.298	0.185	1.514	0.130	− 0.115	1.031
Sex	0.381	0.429	0.104	0.889	0.374	− 0.457	1.227
Careless	0.052	0.469	0.011	0.110	0.913	− 0.885	0.940
Conduct	0.095	0.144	0.082	0.660	0.509	− 0.204	0.363
Sad ~ (R^2 = 0.134)							
CU*sex	− 0.152*	0.070	− 0.269	− 2.162	0.031	− 0.296	− 0.012
CU	− 0.075*	0.038	− 0.264	− 1.974	0.048	− 0.146	0.002
Age	0.173	0.254	0.073	0.682	0.495	− 0.332	0.664
Sex	− 0.208	0.411	− 0.058	− 0.507	0.612	− 1.002	0.591
Careless	− 0.631	0.615	− 0.133	− 1.026	0.305	− 1.761	0.653
Conduct	0.262	0.166	0.232	1.582	0.114	− 0.066	0.595
Interaction effect of sex							
Male	− 0.277	0.085	− 0.533	− 2.678	0.007	− 0.386	− 0.058
Female	− 0.075	− 1.973	− 0.263	0.467	0.058	− 0.147	0.003
Scared in others ~ (R^2 = 0.127)							
cu*sex	− 0.119*	0.060	− 0.264	− 1.987	0.047	− 0.239	− 0.003
CU	− 0.067*	0.031	− 0.298	− 2.188	0.029	− 0.126	− 0.005
Age	− 0.019	0.199	− 0.010	− 0.096	0.924	− 0.382	0.388
Sex	− 0.037	0.327	− 0.013	− 0.113	0.910	− 0.686	0.600
Careless	0.482	0.333	0.127	1.448	0.148	− 0.135	1.230
Conduct	0.088	0.117	0.098	0.751	0.453	− 0.147	0.308
Interaction effect of sex							
Male	− 0.187	0.071	− 0.562	− 2.639	0.008	− 0.318	− 0.043
Female	− 0.067	0.031	− 0.298	− 2.188	0.029	− 0.126	− 0.005
Neutral in others ~ (R^2 = 0.088)							
CU*sex	− 0.101	0.059	− 0.189	− 1.727	0.084	− 0.218	0.011
CU	− 0.061	0.033	− 0.227	− 1.873	0.061	− 0.127	0.004
Age	0.231	0.223	0.103	1.033	0.301	− 0.215	0.661
Sex	− 0.014	0.392	− 0.004	− 0.036	0.971	− 0.800	0.721
Careless	− 0.344	0.700	− 0.077	− 0.492	0.623	− 1.705	1.070
Conduct	0.085	0.180	0.079	0.471	0.638	− 0.249	0.450

Bootstrapped confidence intervals are bias corrected with 2000 resamples. + = bootstrap-based p value, *bootstrap-based p < 0.05

accuracy that are both moderated by sex (std β = − 0.27, p = 0.022; std β = − 0.28, p = 0.028[respectively]; Supplementary Table 5). For specific self-emotion accuracy, the uncaring subscale underlies CU traits association with sad, which is moderated by sex (std β = − 0.38, p = 0.001). For other emotion identification, the callousness and uncaring subscales underlie CU traits association with scared, but where uncaring directly associates (std β = − 0.22, p = 0.041) callousness is moderated by sex (std β = − 0.32, p = 0.042; Supplementary Table 6).

Discussion

The current study further evidences the long line of literature demonstrating emotion identification deficits associated with CU traits but extend this line of work to demonstrate

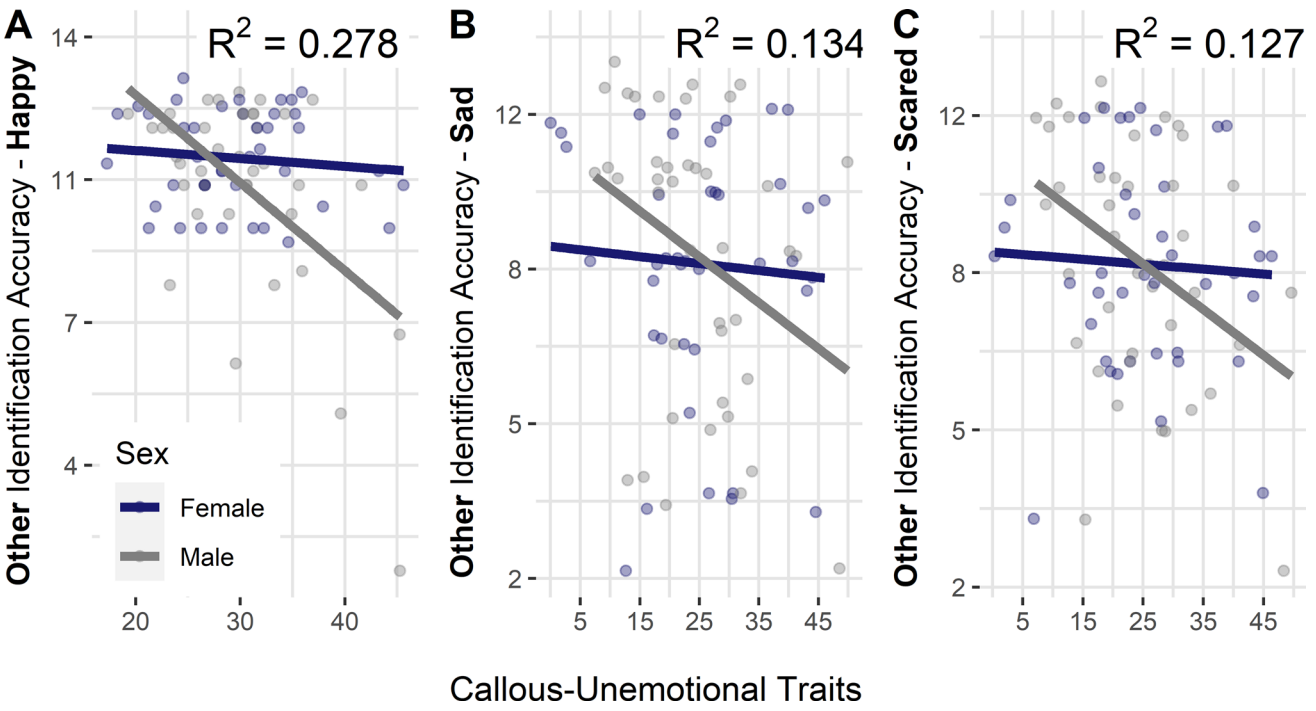

Fig. 3 Depicting other emotion identification accuracy for individual emotions association with CU traits interaction with sex. **A** depicts happy other identification. **B** depicts sad other identification. **C** depicts scared other identification

nuances in self and other emotion identification, subscales driving these associations, and sex effects. Overall, the present study demonstrates less accuracy for both self and other oriented stimuli but no significant change in reaction time. Specific emotions for both self and other centered around happiness, sadness, and fear that demonstrated nuanced sex effects. Overall, these findings provide needed context for understanding emotion identification deficits associated with CU traits.

Sex Moderates CU Traits Association with Other but not Self Emotion Identification

While higher CU traits demonstrated less accuracy for both self and other emotion identification, sex effects were specific to identifying emotions in others. The sex effects indicate the lower capacity to identify other oriented emotion was specific to males as females negative trending slope was not statistically significant. This suggests sex specific impairments that could be an important consideration for tailoring interventions or examining sex differences in antisocial behavior. Importantly, where accuracy was impaired, reaction time did not significantly change as a result of CU traits, which suggests intact perception and identification of the task but inaccuracy in correctly interpreting the stimuli. These findings are largely consistent with the extant literature stating there are impairments in identifying emotions in oneself and in others but extend this by determining specific sex effects that are related to accuracy separate from reaction time.

Specific Emotion Identification Lower at Higher CU Traits and Moderated by Sex Effects

Higher CU traits associated with less identification of happiness, sadness, and fear for both self and other oriented stimuli; and sex moderated all emotions for other oriented stimuli but only sadness for self-identification accuracy. These findings largely support that males' have a more difficult time identifying others' emotions than females but specifies a particular difficulty in identifying sadness in males for both self and other oriented stimuli. The difficulty with happiness, sadness, and fear for both self and other oriented stimuli is largely supported in the literature but extends this by examining both self and other oriented stimuli in one study and identifying sex effects. In all instances where sex moderated, males had a greater decrement in emotion identification, which suggests affective identification impairments associated with CU traits may be particularly pronounced in males. These findings provide important nuance for understanding CU traits between males and females that should be considered in future studies.

CU Trait Subscales Drive Associations with Emotion Identification

For self-emotion identification, the uncaring subscale significantly associated with sad identification and was moderated by sex, which suggest the uncaring component drives this association. For other emotion identification, the callousness and uncaring subscales significantly associated with scared but where uncaring directly associated, callousness was moderated by sex. Callousness is considered the core subscale of CU traits [16] that indicates a disregard for others emotions whereas uncaring indicates a disinterest in performance [39]. It is plausible that uncaring is tapping into a lack of care for performance in identifying others' emotions, which would suggest males care less about accurately identifying sadness in self and that largely ties into understanding fear in other directly (independent of sex). It is also that the callousness dimension taps into a lack of desire to care about others' emotions, which is more associated with males at higher CU traits when recognizing fear in others. These are important distinctions tapping into specific processes that may drive specific emotion identification deficits by sex.

Limitations

The findings of this study must be interpreted under some limitations. First, the present study did not account for anxiety that, as suggested by Dadds et al. [40], may further differentiate emotion identification differences in youth with CU traits. Using anxiety to differentiate between primary and secondary CU traits could be examined in future studies. Second, although adequately powered, the sample was of modest size and future studies should recruit larger samples. Finally, we sampled primarily White participants from the community that may not generalize to other racial backgrounds or forensic populations. Future studies should recruit more diverse samples that include a portion of participants in a forensic setting to determine if there are generalizable feature of the present analysis.

Conclusion

Despite these limitations, the present study adds to the existing literature on emotion identification deficits at higher levels of CU traits but extends this literature by identifying specific emotions for self and other oriented stimuli and sex effects. Findings suggest that CU traits associate with deficits in self and other oriented emotion identification, that are specific to happiness, sadness, and fear. Sex moderated associations between CU traits and self-identification of sadness as well as CU traits and other identification of happiness, sadness, and fear. In all instances of sex moderating these effects, males had much worse accuracy. The uncaring subscale appeared to drive associations with self-identification of sad and both callousness and uncaring drove associations with identifying fear in others. These findings provide a novel context to the extant literature by determining self and other oriented emotion identification deficits using a behavioral paradigm in one sample where an adequate representation of both males and females was present to test sex effects. This study provides important context for understanding emotion identification impairments associated with CU traits that are relevant for future investigations that may identify clinical differences in CU traits between males and females.

Summary

Impairments in emotion identification and emotional under responsiveness are core features of callous-unemotional (CU) traits (for review: [13]. Although substantial research demonstrates this link, less is known about sex effects related to self and other emotion identification in behavioral paradigms amongst these youth (for review: [13]. Given that such work could identify important features of CU traits as well as differentiate sex effects on these impairments, the present study used a behavioral task involving self and other oriented emotion stimuli for specific emotions, with adequate sample of males and females, using total and subscale measures of CU traits. With an adequately powered study with 87 adolescent participants (aged 12–14, 12.86 ± 0.75) and adequate representation of sex (female 51%, male 49%), results revealed CU traits associated with overall self-emotions negatively and sex moderated CU traits negative association with recognizing others overall emotions. CU traits negatively associated with both self and other specific emotion identification for happy, sad, and fear. Sex effects were found via moderation for happy, sad, and fear identification in others but only sad identification for self. No reaction time differences were found. These findings evidence important nuance in CU traits and sex effects with identifying self and other emotions. These results highlight important nuance necessary for understanding CU traits with clinical implications for sex differences that require further consideration.

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