

**Running Head: INVENTORY OF CALLOUS-UNEMOTIONAL TRAITS IN
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Inventory of Callous-Unemotional Traits in a Community Sample of Preschoolers

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Conflict of interest

The authors have no conflict of interest

Abstract

The objective was to test the factor structure of the Inventory of Callous-Unemotional traits (ICU; Frick, 2004) and to study the relation between the derived dimensions and external variables in a community sample of preschool children. A total of 622 children were assessed when the children were 3 and 4 years old with a semi-structured diagnostic interview, the ICU and other questionnaires on psychopathology, temperament and executive functioning, completed by parents and teachers. Confirmatory Factor Analysis derived from teachers' ICU responses yielded three dimensions: callousness, uncaring and unemotional. Callousness and uncaring correlated with the specific scales related to aggressive behavior, temperament, executive functioning and conduct problems. The ICU scale scores discriminated cross-sectionally oppositional defiant disorder (ODD) and conduct disorder (CD) diagnoses, aggressive and non-aggressive symptoms of CD, use of services, and ODD/CD-related family burden. Longitudinally, callousness at age 3 predicted ODD or CD diagnosis at age 4. Unemotional was not associated with aggressive measures, but it was linked to anxiety disorders cross-sectionally and longitudinally. Callous-unemotional traits contributed significantly to predicting disruptive behavior disorders controlling for sex, temperament and executive functioning (predictive accuracy between 3 and 5%). The ICU is a promising questionnaire for identifying early callous and uncaring traits in preschool years that may help in the identification of a subset of preschool children who might have severe behavioral problems.

KEYWORDS: Assessment; Callous-unemotional traits; confirmatory factor analysis; Inventory of Callous-unemotional; preschool.

Introduction

Callous-unemotional (CU) traits help the understanding of antisocial behavior. CU traits distinguish a group of children with severely disordered conduct, showing a specific affective and interpersonal style characterized by lack of empathy, lack of guilt and constricted emotional expression (Frick et al., 2003). CU can have different components related to specific difficulties in different areas, and which reflect a range of developmental processes. Adolescents with conduct disorder (CD) plus CU displayed the highest levels of emotional and behavioral dysregulation, with lack of behavioral inhibition (greater impulsivity-hyperactivity, reward-dominant response style), more severe conduct problems, difficulties for processing negative emotional stimuli (fear and distress in others), low sensitivity to punishment, proactive aggressive behavior, sensation seeking and poorer response to treatment in comparison to young people with CD without CU; this latter group has been described as more reactive to emotional and threatening stimuli, responding more strongly to provocation, with hostile cognitive bias, exposed to dysfunctional parenting practices and of low verbal intelligence (Frick et al., 2003; Frick & White, 2008). It has been proposed that CD without CU may be associated with deficits in emotional self-regulation, whereas CD with CU might be related to deficits in conscience development (Frick & Morris, 2004). CU traits are stable in youngsters aged 8-11 and 12-16 (Barry, Barry, Deming, & Lochman, 2008; Obradović, Pardini, Long, & Loeber, 2007), predict antisocial behavior and future psychiatric difficulties (Loeber, Burke, & Lahey, 2002; Moran et al., 2009), and are correlated with aggressive behavior (especially proactive), oppositional defiant disorder (ODD) and CD (Barry et al., 2008; Scholte & van der Ploeg, 2007). Therefore, it is crucial to identify CU traits early with a view to modifying the empathic development of children with deficits.

Some questionnaires have been developed for assessing CU traits (Frick & Hare, 2001; Forth, Kosson, & Hare, 2003; Scholte & van der Ploeg, 2007). One of the most widely used is the Inventory of Callous-Unemotional traits (Frick, 2004), developed after the Antisocial Process Screening Device (Frick & Hare, 2001). It includes 24 items coded on a 4-point Likert-type scale (0: *not at all true* to 3: *definitely true*) and covering three dimensions: callousness (11 items), uncaring (8 items), and unemotional (5 items). Several versions, with the same content but slight differences of wording, are available for parents, teachers and young people themselves (self-report).

Four studies have confirmed the factor structure of the ICU. Essau, Sasagawa, and Frick (2006) identified three dimensions (callousness, uncaring and unemotional) by exploratory factor analysis in a sample of 1,443 13 to 18-year-old Germans from the general population. These dimensions, plus a common general dimension comprising all the items of the self-reported questionnaire (bifactor model; Chen, West, & Sousa, 2006), were confirmed with confirmatory factor analysis (CFA). Similar structures were extracted when the analyses were carried out separately for boys and girls. Alpha reliability of the individual scales ranged from .66 (unemotional) to .70 (callousness). Kimonis, et al. (2008) confirmed the same three separate factors with the self-reported ICU in a sample of 248 12 to 20-year-old American (USA) juvenile offenders (uncaring, callousness and unemotional). For fitting the model they had to delete two items of callousness (items 2 and 10). The unemotional factor yielded low internal consistency ($\alpha = .53$), but internal consistency was good for callous and uncaring (.80 and .81, respectively). Fanti, Frick, and Georgiou (2009) also obtained the three factors in the self-reported version in a sample of 347 Greek 12 to 18-year-old adolescents from the general population. In this study the bifactor model (callousness, uncaring, unemotional, plus a general factor comprising all the items) obtained the best fit, though not in all the indexes. Alpha reliability of the individual scales ranged from .68 (unemotional) to .79 (callousness).

Finally, Roose, Bijttebier, Decoene, Claes, and Frick (2010) confirmed the same three-bifactor model with 455 Belgian adolescents between the ages of 14 and 20, 154 parents of these young people and 120 teachers. Alpha reliability of the individual self-reported scales ranged from .73 for unemotional to .79 for callousness. In these studies, high ICU scores were correlated with measures of CD, sensation seeking, disinhibition, low agreeableness and conscientiousness, and higher functional impairment (Essau et al., 2006), aggression, delinquency and measures of emotional reactivity (Kimonis et al., 2008), bullying and proactive aggression (Fanti et al., 2009), and other measures of psychopathy, fun seeking, antisocial behavior, low prosocial attitudes, difficulties in empathy, and insensitivity to punishment (Roose et al., 2010). Unemotional was the scale least associated with these measures. Boys scored higher than girls on all the scales (Essau et al., 2006; Fanti et al., 2009).

In sum, previous work on the ICU's properties has been mainly carried out with adolescent samples and mostly using the self-report version; such work has indicated the same structure across cultures and provided favorable evidence on the validity of the questionnaire. However, there is increasing interest in identifying CU traits as early as possible, given the severity of the behaviors with which they are associated and the potential for prevention if they could be reliably and validly detected.

Research on CU traits with preschool children is scarce, despite the fact that it is in this period that aggressive behavior is highly prominent and guilt and empathy begin to emerge (Kochanska, Gross, Lin, & Nichols, 2002; Kochanska & Thompson, 1997). Kimonis, et al. (2006) found an association between CU features and aggression in a sample of 49 children aged 2-5 years enrolled in the Head Start programs, and concluded that individual differences in guilt and empathy, even as early as age 3 or 4, can contribute to behavior problems. Willoughby, Waschbusch, Moore, and Propper (2011) used 5 items from the Child

Behavior Checklist^{1½-5} (Achenbach & Rescorla, 2000) to screen CU traits in a sample of 373 to 5-year-olds from the general population. Using CFA, they reported that CU traits form a construct distinct from those of attention deficit/hyperactivity disorder or ODD. CU traits were stable from ages 3 to 5, and differentiated a group of children with ODD+CU that were less fearful, recovered more easily after an upset, and showed less negative reactivity, lower heart period reactivity and higher levels of general arousal than those with ODD only. Therefore, we need more evidence showing whether the proposed dimensions can be identified early in life and to ascertain whether they have adequate validity, in terms of internal structure and relation to other variables. The goal of this work is to test the factor structure of the Inventory of Callous-Unemotional traits proposed by Frick (2004), and to provide evidence based on their relations with external variables in a community sample of preschool children.

Method

Participants

The data are from the first assessment of a large-scale longitudinal study of behavioral problems in preschool children from age 3 (Ezpeleta, Osa, & Doménech, Submitted). A cross-sectional two-phase design began with the selection of a random sample of 2,283 children from the census of preschoolers in grade P3 (3-year-olds) in Barcelona (Catalonia, Spain). A total of 1,341 families (58.7%) agreed to participate in the first phase of the study, of which 33.6% were of high socioeconomic status, 43.1% middle and 23.3% low. Children's mean age was 3.0 years ($SD = 0.18$), 683 were boys (50.9%) and 89.3% were white. There were no sex differences ($p = .95$) between those who agreed to participate and those who declined, but semi-public schools were significantly more likely to refuse to participate than public ones ($p < .001$), and high socioeconomic status families participated more than low status families (p

< .001). The parents of children participating in this first phase completed the SDQ³⁻⁴ parents' version (Ezpeleta, Granero, Osa, Penelo, & Doménech, 2011), which was used for screening purposes.

In the second phase, all children with a positive screening score for behavioral problems and a random sample of 30% of children with a negative screening score were invited to continue. The final second-phase sample included 622 families (10.6% of those invited refused to participate in the second phase). No differences were found on comparing participants and refusals by sex ($p = .82$) or by type of school ($p = .85$). Ninety-four teachers from 54 schools answered the SDQ³⁻⁴. Children's mean age was 3.0 ($SD = 0.16$), 311 were boys (50.0%) and 89.5% were white, while 33.8% were of high socioeconomic status, 44.9% middle, and 21.3% low. Weighted DSM-IV prevalence in the sample was as follows: 3.7% of the children presented attention deficit/hyperactivity disorder, 6.9% ODD, 1.4% CD, 0.4% major depression, 3.0% minor depression, 2.2% separation anxiety, 3.7% specific phobia and 1.9% social phobia. Children showing intellectual disability or pervasive developmental disorders were excluded, as were three types of families: those with difficulties with Spanish or Catalan, those without a primary caregiver who could report about the child, and those that were moving to another city within a year.

The analysis of this study corresponded to the first two assessments (620 children assessed at age 3 and age 4).

Instruments

The *Inventory of Callous-Unemotional traits* (ICU; Frick, 2004), described in the introduction was answered by the teachers when children were 3 and 4 years old. The total score for each scale was obtained with the nonweighted sum of the item values, after reverse items had been coded, with higher scores indicating greater presence of the construct. The

Spanish version of the questionnaire provided by the author (P. Frick) was adapted to Spanish and Catalan. The final Spanish version was revised by the author and the differences solved by agreement. The Catalan version followed the same wording as the Spanish version. For the first assessment, the Catalan version was chosen by 82% of the teachers and the Spanish version by 18%.

The *Diagnostic Interview for Children and Adolescents for Parents of Preschool and Young Children* (DICA-PPYC; Ezpeleta, Osa, Granero, Doménech, & Reich, 2011) is a computerized semi-structured diagnostic interview for assessing the most common psychological disorders at ages 3-7 years according to the DSM-IV-TR criteria. After the assessment of the symptoms of each disorder, the following information is obtained: clustering, age at onset and at remission of symptoms, duration criteria, consultation and treatment received, impairment at home, at school and with friends, distress, and family burden. Diagnoses are generated by means of computerized algorithms following the DSM-IV-TR criteria (American Psychiatric Association, 2000). Mood disorders include major and minor depression, and anxiety disorders include separation anxiety, generalized anxiety disorder, specific phobia and social phobia. For ODD and CD the definition of Research Diagnostic Criteria - Preschool Age (RDC-PA) (Task Force on Research Diagnostic Criteria: Infancy and Preschool, 2003) is used in addition to the DSM-IV-TR. Basically, the difference with respect to the DSM-IV-TR consists in some changes in the wording of the criteria for CD, the elimination of inappropriate criteria (10, 13, 14, 15) for the age of the children, the inclusion of two alternative criteria (reacts to frustration with aggressive behavior and verbally aggressive) and a 6-month duration; for ODD an additional symptom (difficulty recovering from emotional upset) is added. Disorders are assessed over lifetime. The instrument has shown acceptable test-retest reliability and moderate convergent validity with other measures of psychopathology, as well as the ability to differentiate preschoolers and

young children who had used mental health services, were more impaired, and presented more severe psychopathology (Ezpeleta, Osa, et al., 2011).

DSM-IV-TR CD symptoms were grouped into two categories: aggressive (bullying, fighting, weapon use, cruelty to people, cruelty to animals, stealing with confrontation, and forced sex) and non-aggressive (fire-raising, vandalism, breaking and entering, lying, and stealing without confrontation).

The *Strengths and Difficulties Questionnaire* (SDQ³⁻⁴; Goodman, 1997) was used for screening purposes and was answered by all the parents in the first phase of the study ($N = 1338$) and by teachers of the children participating in the second phase. The SDQ³⁻⁴ has 25 items with 3 response options (0: *not true*; 1: *somewhat true*; 2: *certainly true*). The conduct problems scale, indicating temper tantrums, disobedience, fights, argumentativeness and spitefulness, and the prosocial scale (considerate of others' feelings, shares, kind to others, helping behavior) were used for the analyses. Reverse items were coded in the direction of higher scores indicating more psychopathology.

The *Children's Global Assessment Scale* (CGAS; Shaffer et al., 1983; Ezpeleta et al., 1999) is a global measure of functional impairment filled out after the information has been obtained in a diagnostic interview. Scale scores range from one (maximum impairment) to 100 (normal functioning). Scores of over 70 indicate normal adjustment.

The *Child Behavior Checklist* (CBCL 1^{1/2-5}; Achenbach & Rescorla, 2000) measures behavioral and emotional problems through 100 items with 3 response options (0: *not true*, 1: *somewhat/sometimes true*, 2: *very true/often true*) answered by parents. Two scales closely related to the ICU constructs (emotionally reactive and aggressive behavior), plus two global indices (externalizing and internalizing) were used. The callous-unemotional scale as proposed by Willoughby et al. (2011) was also used (item 27 doesn't seem to feel guilty after

misbehaving; 58 punishment doesn't change behavior; 67 seems unresponsive to affection; 70 shows little affection toward people; 72 shows too little fear of getting hurt).

The *Children's Behaviour Questionnaire for ages 3-7 years* (CBQ3-7; Rothbart, 2001) measures reactive and self-regulative temperament, with 94 items on a 7-point Likert-type scale, ranging from 1 (*extremely untrue*) to 7 (*extremely true*). It was answered by parents and contains 15 scales clustered in 3 broad dimensions of temperament: negative affectivity (anger-frustration, discomfort, fear, sadness, soothability), effortful control (Attention Focusing, Inhibitory Control, Low-intensity Pleasure, Perceptual Sensitivity), and surgency (Activity Level, High-intensity Pleasure, Impulsivity, Shyness).

The *Children's Aggression Scale* (CAS; Halperin & McKay, 2008) assesses aggressive behavior with 22 items on a 5-point Likert-type scale (0: *never* to 4: *many days*). It is structured in 7 primary factors: verbal aggression, aggression against objects and animals, use of weapons, provoked physical aggression, initiated physical aggression, aggression towards peers and aggression towards adults. This questionnaire was applied to preschool teachers so as to provide a baseline in aggressive behavior for the longitudinal study.

The *Relational aggression* measure was created for the study. It contains 13 items on a 5-point Likert-type scale (0: *never* to 4: *many days*) about aggressive behavior in relationships with others (behaving unsociably, crying to get sympathy, being malicious, criticizing others behind their backs, being manipulative, being hurtful, ganging up with other children to isolate a child, etc.). Teachers answered the questionnaire.

The *Behavior Rating Inventory of Executive Function for Preschool Children* (BRIEF-P; Gioia, Isquith, Guy, & Kenworthy, 2000) measures executive functions, with 63 items and 3 response options (0: *never* to 2: *very often/always*) organized in the following scales: inhibit, shift, emotional control, working memory, plan-organize, ISCI index (sum of the items included in inhibition and emotional control), FI index (sum of shift and emotional

control), EMI index (sum of working memory and plan-organize) and GEC index (sum for total scale). It was answered by teachers.

Cronbach's alpha of the instruments is on Table 1.

Procedure

The longitudinal project was approved by the ethics review committee of the authors' institution. Heads of the participating schools and parents were provided with a full description of the study. Families were recruited at the schools and gave written consent. All parents of children from grade P3 at the participating schools were invited to answer the SDQ³⁻⁴, which was completed by families at home and returned to the schools. Families who agreed to participate and met the screening criteria were contacted by telephone and interviewed at the school. Interviewers were previously trained and were blind to the children's screening group. After the interview parents answered the questionnaires, and the questionnaires were then applied to the teachers.

Statistical analysis

The statistical analysis was carried out with SPSS18 and Mplus6. Given the multistage sample, data corresponding to the second phase were analyzed through Complex Samples tools in SPSS, creating a plan file with sampling weights inversely proportional to the probability of participant selection, and with the case weighting procedure in the Mplus6 program.

Confirmatory Factor Analysis (CFA) was conducted with Mplus6, using Weighted Least Squares Means and Variance (WLSMV) adjusted for the categorical data method of estimation. Three models were analyzed to test whether a single-factor model (Model 1: all items loading on a single factor), a 3-factor model (Model 2: items loading on three

intercorrelated factors –callousness, uncaring, and unemotional), or a bifactor model (Model 3: differs from Model 2 in that it also assumes that there is a general dimension underlying all the items and that the factors are uncorrelated) showed the best fit to the data, following previous research on the ICU (Essau et al., 2006; Fanti et al., 2009; Kimonis et al., 2008; Roose et al., 2010). The covariance matrix was analyzed, considering the age 3 and age 4 child ratings as repeated measures. The same configuration was found for the two groups of responses, and error covariances of analogous items were freely estimated (Ferrando, 2000). In addition, analogous factors across groups of responses were allowed to be correlated. Goodness of fit was assessed with the common fit indices (Jackson, Gillaspay, & Purc-Stephenson, 2009): χ^2 , Tucker and Lewis index (TLI), comparative fit index (CFI), and Root Mean Square Error of Approximation (RMSEA). The following thresholds were adopted: RMSEA less than .05 and TLI and CFI greater than .95 are indicative of good fit, whereas RMSEA less than .08 and TLI and CFI greater than .90 represent reasonable fit (Marsh, Hau, & Wen, 2004). In addition, we took into account the magnitude and sign of the parameters (factor loadings) obtained. Internal consistency of the derived scores was measured with Cronbach's α , considering values above .80 as adequate.

ICU scale scores were compared by sex and age with mixed analysis of variance (inter-factor: sex; intra-factor: age). First, the interaction sex \times age was calculated. For non-significant interaction analyses ($p > .10$), main effects for age and sex were obtained, whereas single effects were obtained for significant interactions.

The association between ICU scale scores and DSM-IV-R or RDC-PA disorders was analyzed through binary logistic regressions, entering the three ICU-scores simultaneously into the models. Independent models were obtained for the ICU-total score. The discriminative accuracy was analyzed through area under the receiver operator curve (AUC), considering values below .60 as low, between .60 and .70 as moderate and above .70 as good.

The specific association between ICU dimensions and the number of ODD and CD symptoms (including the CD dimensions aggressive and non-aggressive) was analyzed with General Linear Models (GLM), and global predictive accuracy through R-square coefficients (R^2).

The incremental validity of ICU scores on the ODD-CD disorders or conduct problem scales after adjusting for sex, temperament and executive functioning (CBQ and BRIEF scores) was measured through step-wise regression models (binary logistics for the dichotomous criteria presence/absence of disorders and multiple regression for the criterion SDQ-conduct score). OR and B coefficients, respectively, indicated the specific contribution of the ICU scores to conduct outcomes, and change in R^2 coefficients indicated incremental predictive accuracy.

The association between ICU scales scores and raw scores on the other questionnaires was calculated with Pearson's correlation (r). Due to the large sample size and the high statistical power, poor correlations tended to be statistically significant. Therefore, only correlation coefficients with good effect sizes ($|r| \geq .30$) were considered as relevant.

Results

Confirmatory Factor Analysis for ICU items and Internal Consistency

The goodness-of-fit indices of the 3-factor model (Model 2) were satisfactory — χ^2 (1041) = 3670.3; TLI = .88; CFI = .89; RMSEA = .064 (90% confidence interval [CI], .062; .066) — and better than those of the single-factor model (Model 1): χ^2 (1055) = 6706.3; TLI = .75; CFI = .77; RMSEA = .093 (90% CI: .091; .095) (comparison of nested models: $\Delta\chi^2$ (14) = 972.6; $p < .001$). On the other hand, the bifactor model (Model 3) showed a better goodness-of-fit [χ^2 (1004) = 2864.2; TLI = .91; CFI = .92; RMSEA = .055 (90% CI: .052; .057)] than Model 2, but some of the parameters were found to be unsatisfactory (factor loadings below .40, non-statistically significant, or with a sign opposite to that expected

according to the content of the item). Considering these results, we selected the 3-factor model (Model 2), in which all the item loadings were statistically significant ($p < .001$) and exceeded the .40 value on their factor, except item 10 (“I do not let my feelings control me”) from the callousness dimension. Figure 1 presents standardized factor loadings and standardized factor covariances within each group of responses. Factor correlations between age 3 and age 4 child ratings for analogous factor pairs ranged from .53 (unemotional) to .63 (callousness). Factor correlations between non-analogous factor pairs were lower (–.58 to .12). Separate analyses for girls and boys yielded similar results (detailed parameters and goodness-of-fit-indices are available upon request).

Cronbach’s α values for each scale of the age 3 and age 4 ratings were, respectively, .79 and .81 for callousness, .88 for uncaring (both ratings), .83 and .86 for unemotional, and .89 and .91 for the total score. Alpha comparison tests (Feldt, 1980) showed no statistical differences across groups of responses, except for the unemotional scale ($p = .001$), reports on older children being more consistent.

INSERT FIGURE 1 AND TABLE 1

Longitudinal agreement of ICU scales

Intraclass correlation coefficients between ICU scale scores at ages 3 and 4 were: .53 for callousness, .52 for uncaring, .47 for unemotional and .51 for total scores, indicating that the agreement one year apart was fair.

Comparison of ICU scores by sex and age

Table 2 contains the mean T-scores for the ICU scales and the results of ANOVA procedures analyzing differences by sex and age. No interaction was found for sex and age, indicating that sex differences were equal at ages 3 and 4, and age differences were equal for

boys and girls. For the callousness scale there were no significant age differences ($p = .148$), but boys obtained higher mean T-scores than girls (between 1.7 and 4.0 T-points; $p < .001$). For the uncaring scale there were significant age and sex differences: 3-year-old children obtained higher mean scores than 4-year-olds (the difference was low and clinically not very relevant, between 0.08 and 1.4 T-points), and boys obtained higher mean scores than girls (between 2.3 and 4.6 T-points; $p < .001$). For unemotional there were no significant age differences ($p = .078$), but boys obtained higher mean scores than girls (differences were low in clinical terms, between 0.75 and 4.0 T-points; $p < .001$). Considering the total score, boys achieved statistically higher means than girls (between 1.8 and 3.6 T-points; $p = .001$), but differences by age were not significant.

INSERT TABLE 2

Convergence of ICU dimensions with other dimensional psychological measures

Table 1 shows the Pearson correlations of ICU scales with other psychological measures. Callousness and uncaring scores were highly to moderately associated with teachers' reports of higher conduct problems and prosocial difficulties on the SDQ³⁻⁴, aggressive behavior scales (except use of weapons and aggression towards adults) and executive functioning scales (with the exception of shift); to a lesser extent, these scores were associated with temperament factor of low effortful control. Unemotional scores only correlated with prosocial scale (age 4) and the executive functioning scale shift. The pattern of correlation values was similar at ages 3 and 4.

Association of ICU scales with symptoms and disorders and predictive accuracy

Table 3 presents the association of the ICU scores with DSM-IV diagnoses and symptoms and the instrument's predictive accuracy cross-sectionally (questionnaire and

interview at the same age) and longitudinally (ICU at age 3 and interview at age 4). Cross-sectionally, at age 3 callousness was associated with the number of CD symptoms (total and aggressive); uncaring with the number of total CD symptoms and non-aggressive CD symptoms; unemotional with anxiety disorders; and total score with CD, anxiety disorders and the number of disruptive disorder symptoms. At age 4, callousness was associated with disruptive disorders (especially ODD) and number of CD symptoms (total and non-aggressive); and total score with disruptive disorders (ODD and CD) and number of disruptive disorder symptoms. Longitudinally, callousness at age 3 was significantly associated with disruptive disorders (especially ODD) at age 4, whereas total score at age 3 was associated with CD and number of total and aggressive disruptive symptoms at age 4.

The ICU scales presented low predictive ability to identify not only DSM-IV-TR ODD and CD, but also mood and anxiety disorders. Predictive accuracy was better for identifying RDC-PA oppositional and CD. Total score did not improve the predictions of the 3 scales analyzed together. These results were similar cross-sectionally and longitudinally.

The three ICU scales or total score explain roughly 5% (R^2) of the variability of number of RDC-PA CD symptoms and DSM-IV aggressive symptoms cross-sectionally, but not longitudinally (Table 3).

INSERT TABLE 3

Association of ICU scales with impairment measures and predictive accuracy

Table 3 also presents the association of the ICU scores with measures of impairment and its predictive accuracy cross-sectionally (questionnaire and interview at the same age) and longitudinally (ICU at age 3 and interview at age 4). Cross-sectionally, at age 3 callousness was associated with higher global functional impairment and with ODD/CD-related impairment and family burden; unemotional was associated with low use of services. At age

4, callousness was associated with higher global functional impairment and with ODD/CD-related family burden. Longitudinally, high score on callousness was associated with higher functional impairment at age 4. Total score was associated with high impairment in all the variables at ages 3 and 4, and only with higher family burden longitudinally.

The ICU scales showed, both cross-sectionally and longitudinally, low predictive ability to identify use of services ODD/CD-related impairment. The best predictive ability (of a moderate level) was for identifying family burden. The scales explained between 5% and 8% (R^2) of the variability of global impairment (CGAS).

Incremental validity of ICU scales for conduct problems

Table 4 shows the contribution of ICU scales controlling for sex, temperament and executive functioning to RDC-PA diagnoses and conduct problems of the SDQ. At age 3, after controlling for covariates, ICU scales explained 5.3% of the variability of RDC-PA conduct disorder and 9.5% of SDQ conduct problems (teacher responses); at age 4, ICU scales explained 4.7% of the variability of RDC-PA ODD, 2.1% of SDQ-parents conduct problems and 21.9% of SDQ-teachers conduct problems, which indicates that ICU traits contribute significantly to the diagnosis and detection of disruptive behavior problems.

INSERT TABLE 4

Discussion

This is the first study to explore the psychometric properties of the ICU in preschool children from the general population. It was possible to confirm the three proposed dimensions on the original ICU (callousness, uncaring and unemotional) in 3 and 4-year-old preschool children from the general population. Callousness and uncaring scores correlated with the specific scales related to aggressive behavior, temperament, executive functioning

and conduct problems. The scales were able to discriminate cross-sectionally, and to a moderate level: ODD and CD diagnosis, aggressive and non-aggressive symptoms of CD, use of services and ODD/CD-related family burden. Longitudinally, callousness at age 3 predicted ODD or CD diagnosis at age 4. Unemotional was not associated with aggressive measures, but it was associated with anxiety disorders, both cross-sectionally and longitudinally. CU traits contribute significantly to disruptive behavior disorders beyond sex and measures of temperament and executive functioning. Our results contribute evidence to the feasibility of the questionnaire in different cultures and at different ages, specifically at preschool ages.

Factor analysis permitted the confirmation of the three dimensions as proposed by Frick (2004) with well-fitting indexes. Moreover, this 3-factor model provided a better fit than the competing 1-factor model. Only one item (item 10 callousness: not letting feelings control oneself) was not related to the remaining items from the scale, and this was in line with the findings of previous work carried out with adolescents (Essau et al., 2006; Kimonis et al., 2008). Similar factor structures have emerged in German, US, Cypriot- Greek and Belgian adolescents (Essau et al., 2006; Fanti et al., 2009; Kimonis et al., 2008; Roose et al., 2010) and in Spanish preschool children, the factor structure being replicated across cultures and developmental stages. Considering the reliabilities of the scales in previous studies, the Cronbach's alpha values obtained in the present study were the highest, indicating that the constructs assessed are highly reliable and consistent in preschool children.

ICU dimensions in preschool children converged with aggressive behavior, conduct problems, prosocial difficulties, executive functioning and effortful control difficulties; this was consistent with the associations of callousness previously described in older adolescents (Frick et al., 2003; Frick & White, 2008). Callousness was correlated with conduct problems and aggressive behavior (relational, initiated, and towards peers), with low effortful control

(indicating low ability of planning and suppression of inappropriate responses), and in the executive functioning area with global difficulties, especially in relation to the modulation of inhibitory self-control and to metacognition. The uncaring scale yielded similar, though slightly lower, correlations. Unemotional score showed a different pattern of associations, as is also the case in adolescents. Here, it was related to difficulties in prosocial behavior, in executive function shift (i.e., difficulties for making transitions) and in problem-solving flexibility (leading to difficulties, for instance, when the child is confronted with a change in plans or routine. It should be noted that unemotional score was also related to anxiety disorders. As suggested by Frick and Ellis (1999), we reanalyzed the association of CU traits with anxiety controlling for disruptive disorders (ODD, CD or SDQ conduct problems), but the relationship did not change, and unemotional remained associated with anxiety. Review of cases high in the unemotional factor in an interview with teachers showed that on this scale teachers had identified children with anxious manifestations (shy, social phobia), who certainly had problems expressing their feelings openly, did not show their emotions to others and were not expressive and emotional. In the Kimonis et al. (2008) study, the unemotional scale contained items with low loadings on this factor, and the unemotional factor was that with the lowest and most dubious reliability values (.53) and was unrelated to measures of aggression. In this line, Roose, et al. (2010) concluded that unemotional contains items reflecting emotional expression that appear to be independent of antisocial behavior.

We do not have previous data about the continuity and early predictions of CU traits from preschool years, but what is noteworthy is the predictive association of callousness at age 3 and ODD and functional impairment at age 4, as well as the prediction of total score at age 3 and CD one year later, reflecting the potential utility of the questionnaire for early detection. After controlling for presence of disruptive disorders at age 3, the longitudinal

association remained for ODD (OR 1.13, 95% CI 1.05-1.23) but not for CD (OR 1.02, 95% CI .98-1.06)

Another contribution of this study is to show that, from preschool ages, CU traits contribute distinctly and significantly to disruptive behavior. After controlling for sex, temperament and executive functions, ICU scales made a specific contribution to the variability of ODD, CD and conduct problems.

Taken together, the results suggest that ICU is a promising questionnaire for early identification of callous and uncaring traits in the preschool years, which may help in distinguishing a subset of preschool children with potentially severe behavioral problems. Callous-unemotional traits can be identified early in life, with good reliability and adequate convergent, predictive and incremental validity. However, some limitations should be taken into account on interpreting the present results. We recruited cases from a healthy general population in a country with scarce tradition of participation in research, resulting in a response rate of 59%; even so, given the purpose of the study, which was to provide evidence on the validity of the questionnaire, the participation rate did not adversely affect the results. Also, since we studied a very young sample of the general population, and psychopathology is not very frequent in community samples, we found few cases of CD, so that we used alternative definitions more appropriate for identifying psychopathology in preschool children. Furthermore, we used different informants (parents and teachers), who could observe the child in different situations, but informants did not always report on the same construct; shared teachers informant variance could have inflated the results. Finally, it should also be mentioned that few families of low socioeconomic status participated, and this could have led to bias.

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Table 1. Pearson Correlations of ICU Scales with other Measures and Reliability

| | Cronbach's alpha | | Pearson's correlations | | | | | | | |
|---|------------------|------|------------------------|----------|-------------|-------|-------------|----------|-------------|-------|
| | Age3 | Age4 | Age 3 | | | | Age 4 | | | |
| | | | Callousness | Uncaring | Unemotional | Total | Callousness | Uncaring | Unemotional | Total |
| <i>Psychopathology: SDQ³⁻⁴</i> | | | | | | | | | | |
| Conduct problems (teacher) | .73 | .77 | .60* | .52* | .01 | .53* | .61* | .55* | .03 | .54 |
| Conduct problems (parents) | .59 | .60 | .21 | .23 | .02 | .22 | .21 | .22 | .10 | .23 |
| Prosocial (teacher) | .78 | .77 | .59* | .65* | .27 | .68* | .59* | .68* | .38* | .72* |
| Prosocial (parents) | .56 | .62 | .15 | .13 | .07 | .15 | .09 | .10 | .09 | .12 |
| <i>Psychopathology: CBCL^{1½-5}</i> | | | | | | | | | | |
| Emotionally reactive | .68 | .66 | .13 | .08 | .03 | .10 | .17 | .09 | .10 | .14 |
| Aggressive behavior | .84 | .86 | .19 | .17 | .02 | .17 | .24 | .22 | .09 | .24 |
| Callous-unemotional | .47 | .52 | .15 | .16 | .00 | .15 | .13 | .16 | .02 | .14 |
| Externalizing | .85 | .87 | .23 | .21 | -.01 | .21 | .28 | .27 | .07 | .28 |
| Internalizing | .83 | .82 | .12 | .08 | .12 | .13 | .15 | .08 | .21 | .17 |
| <i>Aggressive behavior: CAS</i> | | | | | | | | | | |
| Verbal aggression | .73 | .72 | .42* | .33* | -.05 | .33* | .63* | .44* | .05 | .50 |
| Aggression objects-animals | .32 | .46 | .32* | .28 | .03 | .29 | .49* | .36* | .07 | .41 |
| Physical aggression | .67 | .65 | .41* | .36* | -.02 | .36* | .50* | .46* | .03 | .45 |
| Use of weapons | .44 | .84 | .07 | .05 | -.05 | .04 | .21 | .15 | .04 | .17 |
| Provoked physical aggression | .36 | .34 | .38* | .33* | -.02 | .32* | .42* | .40* | .02 | .38 |
| Initiated physical aggression | .37 | .44 | .40* | .37* | -.01 | .36* | .50* | .43* | .07 | .45 |
| Aggression towards peers | .84 | .87 | .46* | .39* | -.05 | .38* | .59* | .48* | .06 | .51 |
| Aggression towards adults | .62 | .61 | .21 | .18 | -.03 | .17 | .33* | .17 | -.04 | .20 |
| Total aggression index | .91 | .92 | .47* | .40* | -.03 | .40* | .59* | .48* | .05 | .51* |
| <i>Relational aggression</i> | | | | | | | | | | |
| Relational aggression | .90 | .91 | .52* | .39* | .02 | .43* | .53* | .43* | .10 | .47 |
| <i>Temperament: CBQ</i> | | | | | | | | | | |
| Negative affectivity | .71 | .69 | .01 | -.05 | .11 | .02 | .02 | .00 | .07 | .03 |
| Effortful control | .79 | .77 | -.29 | -.28 | -.03 | -.28 | -.22 | -.24 | -.05 | -.23 |
| Surgency | .74 | .74 | .08 | .15 | -.24 | .03 | .14 | .23 | -.28 | .08 |
| <i>Executive functions: BRIEF</i> | | | | | | | | | | |
| Inhibit | .93 | --- | .62* | .60* | -.06 | .56* | --- | --- | --- | --- |
| Shift | .87 | --- | .29 | .22 | .35* | .36* | --- | --- | --- | --- |
| Emotional Control | .88 | --- | .38* | .36* | -.01 | .35* | --- | --- | --- | --- |
| Working Memory | .95 | --- | .54* | .56* | .15 | .57* | --- | --- | --- | --- |
| Plan/Organize | .89 | --- | .52* | .53* | .16 | .54* | --- | --- | --- | --- |
| ISCI | .94 | --- | .61* | .58* | -.05 | .55* | --- | --- | --- | --- |
| FI | .91 | --- | .39* | .33* | .19 | .40* | --- | --- | --- | --- |
| EMI | .96 | --- | .54* | .56* | .15 | .58* | --- | --- | --- | --- |
| GEC | .97 | --- | .63* | .61* | .12 | .63* | --- | --- | --- | --- |

--- Not assessed for this age. * $|r| \geq .30$

Table 2. Mean scores of ICU scales and comparison by sex and age.

| | Means (T-scores) | | | | Mixed ANOVA (inter factor: sex; intra factor: age) | | | | | |
|-------------|------------------|------|----------------|------|--|-------------|------------|-----------|-------------|--------|
| | Age: 3 yrs-old | | Age: 4 yrs-old | | Sex × age <i>p</i> | Factor: sex | | | Factor: age | |
| | Girls | Boys | Girls | Boys | | <i>p</i> | 95% CI | <i>MD</i> | <i>p</i> | 95% CI |
| Callousness | 48.3 | 51.2 | 47.9 | 50.6 | .736 | <.001 | 1.67; 4.04 | .148 | -0.17; 1.15 | |
| Uncaring | 47.3 | 50.5 | 46.3 | 50.0 | .487 | <.001 | 2.28; 4.56 | .029 | 0.08; 1.39 | |
| Unemotional | 48.4 | 50.5 | 49.3 | 50.8 | .411 | .001 | 0.75; 2.96 | .078 | -0.07; 1.27 | |
| Total score | 48.0 | 50.7 | 47.8 | 50.5 | .838 | .001 | 1.83; 3.60 | .432 | -0.31; 0.72 | |

MD: mean difference (contrast). *CI*: Confidence interval

Table 3. Cross-sectional and longitudinal predictive accuracy of ICU scores at ages 3 and 4.

| OR (logistic regressions) | Cross-sectional predictive accuracy | | | | | | | | | | | | Longitudinal predictive accuracy | | | | | |
|----------------------------------|-------------------------------------|-------|-------|----------------|--------|----------------|--------------------------|-------|-------|----------------|--------|----------------|----------------------------------|-------|-------|----------------|-------|----------------|
| | ICU and interview: age 3 | | | | | | ICU and interview: age 4 | | | | | | ICU: age 3; interview: age 4 | | | | | |
| | Call. | Unc. | Une. | AUC | Tot | AUC | Call. | Unc. | Une. | AUC | Tot | AUC | Call. | Unc. | Une. | AUC | Tot | AUC |
| Disruptive: ODD or CD | 1.04 | 1.03 | 0.97 | 0.58* | 1.02 | .57 | 1.08* | 1.01 | 1.01 | .60* | 1.04* | .61* | 1.11* | 0.99 | 0.95 | .60* | 1.03 | .54 |
| Oppositional defiant disorder | 1.03 | 1.01 | 0.96 | 0.56 | 1.01 | .54 | 1.08* | 1.01 | 1.01 | .60* | 1.04* | .62* | 1.11* | 0.99 | 0.95 | .60* | 1.03 | .54 |
| Oppos'l. defiant dis. (RDC) | 1.03 | 0.99 | 0.98 | 0.54 | 1.00 | .51 | 1.10* | 0.99 | 1.08 | .93* | 1.05* | .61* | 1.13* | 0.96 | 0.98 | .60* | 1.03 | .53 |
| Conduct disorder (RDC) | 1.11 | 1.06 | 1.00 | 0.72* | 1.07* | .71* | 1.06 | 1.04 | 1.03 | .66* | 1.05* | .65* | 1.06 | 1.06 | 0.96 | .62* | 1.04* | .64* |
| Mood disorders | 0.95 | 1.06 | 1.09 | .61* | 1.02 | .57 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Any anxiety disorder | 1.03 | 0.96 | 1.23* | 0.68* | 1.03* | .60* | 0.90 | 1.06 | 1.10 | .59* | 1.01 | .53 | 0.93 | 0.98 | 1.12* | .62* | 0.99 | .51 |
| B-coefficients (linear regress.) | Call. | Unc. | Une. | R ² | Tot | R ² | Call. | Unc. | Une. | R ² | Tot | R ² | Call. | Unc. | Une. | R ² | Tot | R ² |
| Num. ODD symptoms | 0.02 | 0.02 | -0.01 | 0.01 | 0.02* | .01 | 0.03 | 0.01 | 0.03 | .03 | 0.02* | .03 | 0.03 | 0.02 | -0.01 | .02 | 0.02* | .02 |
| Num. CD symptoms (DSM) | 0.02* | 0.01* | -0.01 | 0.05* | 0.01* | .04* | 0.02* | 0.00 | 0.00 | .05* | 0.01* | .04* | 0.01 | 0.00 | 0.00 | .02 | 0.01* | .02 |
| Num. CD symptoms (RDC) | 0.04* | 0.02 | -0.01 | 0.06* | 0.02* | .05* | 0.03* | 0.00 | 0.01 | .05* | 0.01* | .04* | 0.01 | 0.01 | 0.00 | .01 | 0.01* | .01 |
| Num. CD aggressive symp. | 0.02* | 0.01 | -0.01 | 0.05* | 0.01* | .04* | 0.01 | 0.00 | 0.00 | .02 | 0.00 | .01 | 0.01 | 0.00 | 0.00 | .02 | 0.01* | .02 |
| Num. CD non-aggress. symp. | 0.01 | 0.01* | -0.01 | 0.02 | 0.01* | .01 | 0.01* | 0.00 | 0.00 | .04* | 0.01* | .03 | 0.00 | 0.00 | 0.00 | .01 | 0.01 | .01 |
| CGAS: total score | -0.36* | -0.05 | -0.18 | 0.05* | -0.19* | .04* | -0.36* | -0.12 | -0.18 | .08* | -0.21* | .08* | -0.32* | -0.06 | -0.14 | .05* | -0.17 | .05* |
| OR (logistic regressions) | Call. | Unc. | Une. | AUC | Tot | AUC | Call. | Unc. | Une. | AUC | Tot | AUC | Call. | Unc. | Une. | AUC | Tot | AUC |
| Use of services for ODD- CD | 1.05 | 1.07 | 0.90* | 0.64* | 1.03* | .58* | 1.03 | 1.04 | 1.00 | .59* | 1.03* | .58* | 1.05 | 1.01 | 0.98 | .55 | 1.02 | .53 |
| Impairment for ODD-CD | 1.06* | 1.03 | 0.97 | 0.59* | 1.03* | .57* | 1.04 | 1.03 | 1.02 | .59* | 1.03* | .59* | 1.06 | 0.99 | 0.96 | .55 | 1.01 | .51 |
| Family burden for ODD-CD | 1.14* | 1.02 | 0.96 | 0.72* | 1.06* | .67* | 1.13* | 1.00 | 1.11 | .71* | 1.08* | .67* | 1.08 | 1.03 | 1.04 | .52 | 1.05* | .62* |

Call.: Callousness; Unc.: Uncaring; Une.: Unemotional; Tot: Total

Regressions entering the three ICU scores simultaneously. AUC: area under the ROC. R² adjusted.

ODD: oppositional defiant disorder. CD: conduct disorder.

--- Not calculable due the low prevalence for this age. *Significant coefficient (OR, B, R² or AUC, at 0.05 level).

Table 4. Incremental validity of ICU scales for disruptive disorders (ODD and CD) and conduct problems (SDQ)

| | ODD RDC-PA | | CD RDC-PA | | SDQ Teacher Conduct problems | | SDQ Parent Conduct problems | | |
|--------------------------|-----------------|-------|-----------|-------|---------------------------------|--------|--------------------------------|--------|-------|
| | OR | | OR | | B | | B | | |
| | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 | Age 3 | Age 4 | |
| Step 1 | | | | | | | | | |
| Sex | 0.83 | 1.12 | 1.08 | 0.70 | -0.10 | -0.14 | -0.20 | -0.14 | |
| CBQ Negative affectivity | 2.64* | 5.30* | 3.20* | 7.32* | 0.29* | 0.11 | 0.55* | 0.81* | |
| CBQ Effortful control | 0.46* | 0.41* | 0.49 | 0.52 | -0.13 | -0.08 | -0.29* | -0.74* | |
| CBQ Surgency | 1.30 | 1.34 | 0.98 | 2.56 | 0.03 | 0.19 | 0.33* | 0.17 | |
| BRIEF Inhibit | 0.98 | 1.05 | 1.12* | 1.07 | 0.17* | 0.17* | 0.03 | 0.03* | |
| BRIEF Shift | 0.93 | 1.04 | 0.84 | 0.91 | -0.06* | -0.06* | -0.04 | -0.01 | |
| BRIEF Emotional Control | 1.11 | 1.02 | 1.08 | 0.99 | 0.25* | 0.12* | 0.05 | 0.41 | |
| BRIEF Working Memory | 0.98 | 1.04 | 0.99 | 1.06 | -0.06* | -0.07* | 0.01 | -0.03 | |
| BRIEF Plan/Organize | 1.02 | 0.86 | 0.89 | 0.83 | -0.01 | -0.02 | 0.03 | 0.01 | |
| | R ² | .145* | .240* | .176* | .235* | .545* | .336* | .156* | .252* |
| Step 2 | | | | | | | | | |
| Sex | 0.82 | 0.97 | 0.94 | 0.60 | -0.11 | -0.25* | -0.21 | -0.19 | |
| CBQ Negative affectivity | 2.64* | 5.35* | 2.92* | 6.91* | 0.25* | 0.03 | 0.54* | 0.80* | |
| CBQ Effortful control | 0.45* | 0.43* | 0.48 | 0.50 | -0.02 | 0.05 | -0.27* | -0.70* | |
| CBQ Surgency | 1.32 | 1.79 | 1.07 | 3.19 | 0.08 | 0.15 | 0.34* | 0.21* | |
| BRIEF Inhibit | 0.98 | 1.02 | 1.07 | 1.06 | 0.10* | 0.08* | 0.01 | 0.02 | |
| BRIEF Shift | 0.92 | 1.04 | 0.83 | 0.89 | -0.07* | -0.02 | -0.05 | -0.00 | |
| BRIEF Emotional Control | 1.11 | 1.04 | 1.09 | 1.02 | 0.24* | 0.13* | 0.05 | 0.05 | |
| BRIEF Working Memory | 0.98 | 1.05 | 0.96 | 1.08 | -0.08* | -0.08* | 0.01 | -0.03 | |
| BRIEF Plan/Organize | 1.02 | 0.86 | 0.88 | 0.82 | -0.02 | -0.04 | 0.03 | 0.00 | |
| ICU Callousness | 1.01 | 1.09 | 1.09 | 1.05 | 0.16* | 0.19* | 0.01 | 0.01 | |
| ICU Uncaring | 0.98 | 0.96 | 1.10 | 0.97 | 0.06* | 0.12* | 0.03 | 0.03 | |
| ICU Unemotional | 1.01 | 1.14* | 1.09 | 1.18 | 0.00 | -0.08* | 0.02 | 0.04 | |
| | ΔR ² | .001 | .047* | .053* | .029 | .095* | .219* | .010 | .021* |

On step 2 regressions obtained entering the three ICU scores simultaneously.

ΔR²: increase (change) in the R² for the second-step regression. R²: R² for the first-step model.

ODD: oppositional defiant disorder. CD: conduct disorder.

*Significant coefficient (OR, B, R² or AUC, at 0.05 level).

Figure 1: Standardized factor loadings and factor correlations for age 3 (left) and age 4 (right) child ratings. Error variances and covariances are omitted. Items * are reversed. In italics: non-statistically significant parameters ($p > .05$).

