Triarchic Dimensions of Psychopathy in Young Adulthood: Associations With Clinical and Physiological Measures After Accounting for Adolescent Psychopathic Traits

Melina Nicole Kyranides and Kostas A. Fanti
University of Cyprus

Maria Sikki
Leiden University

Christopher J. Patrick
Florida State University

This study examined associations of psychopathy facets of boldness, meanness, and disinhibition with clinically relevant variables and physiological reactivity to affective stimuli. These associations were examined after accounting for developmental associations with adolescent psychopathic traits, namely callous–unemotional traits, narcissism, and impulsivity. Psychopathic traits were assessed during adolescence using the Antisocial Process Screening Device and the Inventory of Callous Unemotional traits and during young adulthood via the Triarchic Psychopathy Measure. Clinical variables ($N = 99$, $M_{age} = 15.91$, 53% female), as well as affective and physiological responses (heart rate, skin conductance, startle modulation) to violent and erotic videos ($N = 88$, $M_{age} = 19.92$, 50% female) were also assessed during adulthood. After accounting for adolescent psychopathic traits, *boldness* was associated with high cognitive reappraisal and low anxiety, fear, and hostility, and *meanness* was related to callous–unemotional traits, hostility, less sympathy to victims, and less use of cognitive reappraisal. *Disinhibition*, by contrast, was associated with impulsivity, increased anxiety, and hostile and aggressive tendencies, as well as conduct disorder, antisocial personality disorder symptoms, and cognitive suppression. In addition, evidence was found for different physiological measures operating as biological indicators of these distinctive dimensions, with reduced resting heart rate and cardiac reactivity to violent stimuli indicative of boldness, above and beyond adolescent psychopathic traits, and low startle potentiation for violent stimuli indicative of callous–unemotional traits and meanness. These findings provide evidence for the value of a multidomain approach for clarifying neurobiological mechanisms of psychopathic tendencies that can inform prevention and treatment efforts.

Keywords: meanness, boldness, disinhibition, adolescent psychopathy, physiological, startle reactivity

The triarchic model, which defines psychopathy as encompassing three distinct but interrelated phenotypic dispositions—boldness, meanness, and disinhibition—has proven to be useful for understanding the content coverage of alternative measures of psychopathy, associations with antisocial behavior, personality traits, and maladaptive outcomes (e.g., Drislane et al., 2015; Drislane, Patrick, & Arsal, 2014; Fanti, Kyranides, Drislane, Colins, & Andershed, 2016; Hall et al., 2014; Patrick, 2010; Patrick, Fowles, & Krueger, 2009). Research on the triarchic model has continued to be important due to its integrative perspective and in light of

significant controversy still troubling the field. The current study adds to this line of work by evaluating associations of the triarchic domains with measures of aggression, emotional regulation, and psychopathology during young adulthood, after controlling for known correlates of triarchic dimensions assessed during adolescence, namely callous–unemotional (CU) traits, narcissism, and impulsivity. By doing so, the current study adds a development perspective to existing work. Another novel contribution of the current study is the investigation of how the triarchic domains relate to heart rate, skin conductance, and startle reactivity to violent and erotic videos, after accounting for adolescent-assessed psychopathic traits.

Triarchic Model: Associations With Behavioral and Trait Variables

Investigating associations with conceptually relevant behavioral and personality criteria is crucial to clarifying the scope and boundaries of the triarchic model constructs (i.e., their nomological networks). *Boldness* as defined in the model entails the ability to remain calm and focused in stressful situations with high tolerance for novelty and risk (Patrick et al., 2009). Empirically, boldness is correlated with extraversion; fearlessness; sensation

seeking; and low levels of anxiety, anger, and hostility (Drislane et al., 2015, 2014; Fanti, Kyranides, et al., 2016; Sellbom & Phillips, 2013; Stanley, Wygant, & Sellbom, 2013). Emotional resilience in high-bold individuals may also be associated with greater use of affect-regulation strategies, such as cognitive reappraisal. However, only one study, to our knowledge, has tested for a relationship between affect-regulation strategies and psychopathy (Burns, Roberts, Egan, & Kane, 2015), but this study did not assess for differential associations with distinct psychopathic dimensions. Further, although boldness is known to relate to the interpersonal factor of psychopathy and to narcissistic personality tendencies (Fanti, Kyranides, et al., 2016; Hall et al., 2014; Sellbom & Phillips, 2013; Stanley et al., 2013), no prior work has investigated whether this association holds longitudinally. Recently boldness was found to be a key variable differentiating psychopathy from antisocial personality disorder (ASPD) in prison inmates, showing an association with psychopathy but not with ASPD (e.g., Wall, Wygant, & Sellbom, 2015).

The *meanness* facet of the triarchic model is related to the deficient affective features of adult psychopathy and the CU features of child psychopathy, and it entails lack of empathy, deliberate cruelty toward others, low emotional attachment, and shallow affect (Patrick et al., 2009). Meanness has also been associated with predatory and destructive forms of aggression and is uncorrelated with measures of anxiety (Drislane et al., 2014; Fanti, Kyranides, et al., 2016; Patrick, 2010). Both meanness and CU traits have been associated with symptoms of conduct disorder and ASPD (e.g., Frick, Ray, Thornton, & Kahn, 2014; Strickland, Drislane, Lucy, Krueger, & Patrick, 2013). The antisocial behavior of individuals high on traits associated with meanness has been linked to fearlessness (Fanti, Panayiotou, Lazarou, Michael, & Georgiou, 2016; Frick et al., 2014), as well as poverty of affect and lack of close attachments (Drislane et al., 2015; Hall et al., 2014).

Disinhibition is related to the impulsive facet of child and adult psychopathy and reflects tendencies toward weak restraint, lack of planfulness and self-discipline, irresponsibility and social deviance, poor emotional control, hostility, and irritability or anger (Drislane et al., 2015; Fanti, Kyranides, et al., 2016; Patrick et al., 2009; Sellbom & Phillips, 2013; Stanley et al., 2013). Prior work has shown that, as with meanness, disinhibition is related to symptoms of child conduct disorder and ASPD (Strickland et al., 2013), which may be due to hyperresponsiveness to immediate reward cues along with a lack of consideration of possible negative consequences. Individuals high on disinhibition also tend to exhibit increased levels of anxiety (Drislane et al., 2014; Fanti, Kyranides, et al., 2016). Additionally, the lack of emotional control seen in high-disinhibited individuals (Drislane et al., 2014) might be associated with an inability to use emotion-regulation strategies or the use of less-adaptive strategies (suppression)—and as such, disinhibition is expected to be more strongly related to various types of aggression, reflecting anger proneness and poor self-control.

With few exceptions, research has supported the idea that child or adolescent psychopathy resembles adult psychopathy (Lynam & Gudonis, 2005) and is relatively stable across time (Blonigen, Hicks, Krueger, Patrick, & Iacono, 2006). Although studies have provided evidence for associations between boldness and narcissism, between meanness and CU traits, and between disinhibition and impulsivity (Benning, Patrick, & Iacono, 2005; Patrick, 2010;

Patrick et al., 2009), no prior work has investigated how adolescent psychopathy measures relate longitudinally to triarchic psychopathy dimensions assessed during adulthood. In addition, in terms of testing a developmental model of psychopathy, it is important to investigate whether the associations between triarchic psychopathy dimensions remain significant after controlling for associations with youth psychopathic traits.

Triarchic Model: Associations With Physiological Measures

Individuals high in psychopathic traits have shown a pattern of underreactivity to aversive stimuli, which disposes toward antisocial behavior due to weak fear conditioning and an affiliated lack of concern for the negative consequences of their behavior (Fanti, Panayiotou, Lazarou, et al., 2016; Raine, 2002). Supporting this low-fear hypothesis, individuals identified with high psychopathic traits, on the basis of self-report and interview assessments of psychopathy—that is, personality-trait estimates based on ratings on the Psychopathy Checklist—Revised (PCL–R; Hare, 1991)—display low resting autonomic activity (heart rate and skin conductance) and reduced autonomic reactivity when viewing unpleasant stimuli (Benning et al., 2005; Lorber, 2004). Further, fearless dominance, a concept related to boldness, correlates with diminished acquisition of physiological fear and smaller skin conductance responses to aversive pictures, findings not true for impulsive antisociality, a concept similar to disinhibition (Benning et al., 2005; Dvorak-Bertsch, Curtin, Rubinstein, & Newman, 2009; López, Poy, Patrick, & Moltó, 2013). In addition, antisocial youth high on CU traits, akin to meanness, show reduced autonomic reactivity (skin conductance and heart rate) to emotionally evocative (i.e., fearful) stimuli (see Frick et al., 2014, for a review). Although no prior work has compared relations of the three dimensions of the triarchic model with autonomic reactivity to aversive-violent stimuli, prior work with related measures assessed among youth and adults has suggested that atypical electrodermal and cardiovascular response patterns might serve as biological referents for boldness and meanness but not disinhibition. These findings further suggest that it is important to investigate associations with psychopathic traits assessed during different developmental periods.

Empirically, fearlessness in individuals with psychopathic traits has been documented by the absence or restricted display of startle potentiation during exposure to fearful or aversive stimuli. It is important to note that the absence of aversive startle potentiation may reflect diminished amygdala activity, which is theoretically and empirically linked to fear (e.g., Davis, 1989; Kramer, Patrick, Krueger, & Gasperi, 2012; Patrick, 1994). Aversive startle potentiation is reduced among fearless individuals or persons scoring high on the PCL–R's affective-interpersonal or the Psychopathic Personality Inventory's fearless dominance dimensions of psychopathy but not the impulsive-antisocial dimension (Benning et al., 2005; Fanti, Panayiotou, Kyranides, & Avramides, 2016; Vaidyanathan, Patrick, & Bernat, 2009; Vanman, Mejia, Dawson, Schell, & Raine, 2003). Further, children and adults high in CU traits have shown a pattern of underreactivity and low startle potentiation to aversive or fearful stimuli (Fanti, Panayiotou, Kyranides, & Avramides, 2016; Fanti, Panayiotou, Lazarou, et al., 2016). Although no prior work has investigated associations of the

triarchic dimensions with startle, variables related to boldness and meanness across different development stages have appeared to be negatively associated with startle potentiation to aversive stimuli, in ways not evident for disinhibition. These findings agree with the suggestion that both boldness and meanness are expressions of genotypic fearlessness and that these facets of psychopathy index aspects of dispositional fear or fearlessness (Patrick & Drislane, 2015).

Current Study

Most research to date on the triarchic model has focused on adult samples. Adding to this line of research, one aim of the present study was to examine how the phenotypic facets of the triarchic model relate to measures of a range of clinically relevant traits and problem behaviors in a community sample followed from adolescence to young adulthood. These associations were examined at the zero-order level, after accounting for unique associations among the triarchic dimensions and after controlling for youth psychopathy related measures assessed during adolescence, including narcissism, impulsivity, and CU traits. Additionally, only limited data exist to date on the physiological correlates of the triarchic model constructs. To our knowledge, the current study is the first to evaluate how boldness, meanness, and disinhibition are associated with physiological responses (along with self-reports of emotional experience) to negatively and positively valenced stimuli along with neutral stimuli—in the form of affective scenes. Furthermore, no other study has examined associations of the Triarchic Psychopathy Measure (TriPM; Patrick, 2010) facets with physiological activity after controlling for adolescence-assessed psychopathic traits.

Specific hypotheses were as follows:

1. Boldness, Disinhibition, and Meanness as rated by the TriPM were predicted to be associated developmentally with adolescent narcissism, impulsivity, and CU traits, respectively.

2. After controlling for developmental associations with adolescent psychopathic traits, we expected TriPM Boldness to be associated with high cognitive reappraisal, low levels of anxiety, and hostility; Meanness was expected to predict conduct disorder, ASPD, and aggression; and Disinhibition was predicted to be associated with elevated anger, hostility, anxiety, aggression, conduct disorder, and ASPD symptoms, as well as limited use of cognitive reappraisal.

3. On the basis of the definition of the TriPM dimensions (Patrick et al., 2009), boldness was expected to be associated with lower reports of fear in response to violent stimuli, whereas meanness and CU traits were expected to relate with lower reports of sadness and sympathy toward victims of violence.

4. Further, on the basis of prior physiological research findings, we expected TriPM Boldness and Meanness, but not Disinhibition, to be associated with lower levels of heart rate, skin conductance, and startle potentiation in relation to aversive-violent scenes specifically, at both

the zero-order level and after controlling for adolescent psychopathic traits (Benning et al., 2005; Kyranides, Fanti & Panayiotou, 2015). Erotic scenes were included along with neutral scenes as comparison and control conditions, respectively.

Method

Participants and Data Collection

Data were collected during two developmental stages, adolescence (Phase 1) and young adulthood (Phase 2). During adolescence, a large sample of high school students ($N = 2,414$; $M_{age} = 15.96$, $SD = 0.89$; 55% female) completed a questionnaire package. From this sample, youth differing on levels of psychopathic traits were randomly selected to be followed longitudinally ($N = 99$; $M_{age} = 15.91$, $SD = .90$; 53% female). These adolescents were equally divided in three groups on the basis of their scores on measures of psychopathic traits: low risk (<1 SD), moderate risk (average levels), and high risk (>1 SD). The study was approved by the Cyprus Ministry of Education and Culture. Parents were informed of the longitudinal and experimental nature of the study and consented to their child's participation.

The participants selected during adolescence were contacted via telephone approximately four years later (see Phase 2). During this phase, all members of the sample ($N = 99$; $M_{age} = 19.94$, $SD = .97$) completed a questionnaire package using a secure Internet-based platform. Participants were asked whether they had a history of epilepsy or any other serious mental or physical handicap that could preclude them from completing the experiment. None were reported. After completing the questionnaires, 88 of the 99 participants ($M_{age} = 19.92$, $SD = .99$; 50% female) completed the experimental session, in which their responses (physiological and subjective) to affective and neutral video stimuli were assessed. According to a power analysis, for a regression with six predictors, with medium effect size ($f^2 = .20$) and a probability of .05, a sample of at least 75 participants is considered adequate (Soper, 2016), suggesting that the study's sample is sufficient for the planned analyses. All participants provided consent for engagement in the experimental phase of the study. In return for their participation, each participant received a small monetary reimbursement (€20).

Phase 1: Adolescence

Psychopathic traits.   The Inventory of Callous–Unemotional Traits (ICU; Frick, 2004) is a self-report measure used for assessing CU traits. The ICU consists of 24 items forming a total score ($\alpha = .80$; e.g., "I do not feel remorseful when I do something wrong"), each rated on a 4-point Likert-scale ranging from 0 (*not at all*) to 3 (*definitely true*). Previous research has verified the reliability and validity of the ICU in multiple Greek-speaking samples (e.g., Fanti, Kyranides, et al., 2016; Fanti, Panayiotou, Kyranides, & Avramides, 2016).

The Antisocial Process Screening Device (APSD; Frick & Hare, 2001) is a self-report rating scale designed to assess dimensions of psychopathy among youth, for which substantial support for reliability and validity has been reported (e.g., Frick & Hare, 2001). APSD items are rated on a three-point Likert scale ranging from 0

(*not at all true*) to 2 (*definitely true*). For the present study, data for two of three APSD subscales, Impulsivity (five items; $\alpha = .64$) and Narcissism (seven items; $\alpha = .75$), were collected.

Phase 2a: Young Adulthood—Questionnaire Assessment

TriPM boldness, meanness, and disinhibition. The Triarchic Psychopathy Measure (TriPM; Patrick, 2010) is a 58-item self-report inventory designed to index the phenotypic facets of boldness, meanness, and disinhibition. Items are scored using a 4-point Likert scale ranging from 0 (*False*) to 3 (*True*). Responses are summed to yield scores on subscales of Boldness (19 items; $\alpha = .74$), Meanness (19 items; $\alpha = .90$), and Disinhibition (20 items; $\alpha = .86$). The TRiPM has been validated and used in a Greek-speaking sample in Cyprus (Fanti, Kyranides, et al., 2016).

Aggression, psychopathology, and clinically relevant traits. The Buss and Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992) is a 29-item scale with the following subscales: Physical Aggression (nine items; $\alpha = .74$), Verbal Aggression (five items; $\alpha = .72$), Anger (seven items; $\alpha = .78$), and Hostility (eight items; $\alpha = .85$). Each item is rated on a scale ranging from 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*). The BPAQ subscales show acceptable reliability and validity (Bryant & Smith, 2001).

The Adult Self-Report Inventory–4 (ASRI-4; Gadow, Sprafkin, & Weiss, 2004) was used to assess ASPD and conduct disorder as defined in the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM–5;* American Psychiatric Association [APA], 2013). Symptoms on the ASRI-4 are rated on a 4-point Likert-type scale ranging from 0 (*never*) to 3 (*very often*). The items were summed to create overall ASPD ($\alpha = .76$) and conduct disorder ($\alpha = .83$) symptom scores for the purposes of the current study. Research with clinical and community samples has demonstrated that scores on the ASRI-4 show convergent and discriminant validity (Gadow et al., 2004).

The State–Trait Anxiety Inventory (STAI; Spielberger, 1983) is a 40-item self-report measure that indexes the intensity of state and trait anxiety. Items of the STAI are scored using a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*almost always*). In the current study, only items assessing trait anxiety (20 items; $\alpha = .74$), which refers to an individual's general tendency to perceive situations as threatening, were used. The STAI has demonstrated acceptable internal reliability and construct validity in prior work (Fanti, Kyranides et al., 2016).

The Emotion Regulation Questionnaire (ERQ; Gross & John, 2003) is a 10-item self-report measure containing two scales that index differing emotion regulation strategies: *cognitive reappraisal* (six items; e.g., "When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm"; $\alpha = .86$) and *expressive suppression* (four items; e.g., "I keep my emotions to myself"; $\alpha = .83$). Items are rated on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*). In prior work, the ERQ has demonstrated good internal consistency and acceptable ($\sim.70$) 2-month test–retest reliability (Gross & John, 2003).

Phase 2b: Young Adulthood—Experimental Assessment

Experimental materials. Six erotic, six violent, and six neutral scenes, each of 1-min duration, were used in the current study (for validation and norming information see Fanti, Kyranides, & Panayiotou, 2015 and Kyranides et al., 2015). Violent and erotic scenes were selected to differ on valence (pleasantness) and to be higher on arousal than were neutral scenes. Violent scenes were excerpts from cinematic productions and included video segments from the following feature films: *Law Abiding Citizen* (2009), *American History X* (1998), *Lucky Number Slevin* (2006), *Rambo 4* (2008), *The Killer Inside Me* (2010), and *The Brave One* (2007). All scenes included realistic depictions of shooting, fighting, beatings, amputations, and stabbings and contained violence for the entire 60-s duration, with a clear distinction between the victim and perpetrator. The erotic scenes were chosen from the following: *Cruel Intentions* (1999), *Original Sin* (2001), *The Lucky One* (2012), *Shout 'Em Up* (2007), *The Sleeping Dictionary* (2003), and *Suits* (2011). Erotic scenes included kissing, nudity, and love making, extending across the 60-s duration of the scene, with male and female actors. Neutral scenes depicted nature scenes with little human or animal activity (e.g., scenes of the Himalayas, the solar system, the Andes Mountains, limestone, the Tanami Desert, hoodoos). All scenes were in English and included music and some dialog or commentary of approximately equal duration across categories. Video soundtracks were reduced in volume such that the mean volume across each scene was 70 dB, in order to ensure that the acoustic startle probes (see the Apparatus section) could be easily perceived.

Apparatus. The timing of events, the presentation of auditory and visual stimuli, and the recording of participants' responses were controlled by an E-Prime 2.0 script (Schneider, Eschmann, & Zuccolotto, 2002). Auditory stimuli (i.e., video soundtrack and startle probes) were presented binaurally via supra-aural headphones in order to mask ambient noise. Visual stimuli were presented on a computer screen (47 cm $\times$ 24.5 cm) placed 150 cm from the participant. All physiological signals were collected using BIOPAC MP150 for Windows bioamplifiers and transducers, running Acq4.2 data acquisition software (Acknowledge 4.2; Biopac Systems Inc., California, USA). Physiological measures were continuously monitored during the recording session and visually inspected offline.

Startle reflex. Noise probe stimuli for eliciting the blink startle reflex consisted of 50-ms bursts of 100-dB white noise with near instantaneous rise time, generated using the Audacity software package (Audacity®. Version 2.1.1). To reduce predictability, we presented startle probes at varying points during video scenes. Nine of the 18 scenes included three startle probes each, presented near the beginning (i.e., Time 10 s), middle (25 s) and end (45 s) of the video. Three scenes included two startle probes each, and another three scenes included only one startle probe, presented at the beginning, middle, or end of the scene. The remaining three scenes did not include any startle probes. Participants heard 36 startle probes in total, equally distributed across each video category.

Heart rate (HR). HR data were acquired using the electrocardiogram (ECG) module of the Biopac system. ECG was recorded using two 11-mm disposable Ag/AgCl pregelled electrodes placed on the right and left inner forearms of the participant. The

ECG signal was amplified with a gain of 500, filtered using a Biopac ECG100C bioamplifier and sampled online at 1000 Hz, then converted offline to beats per minute values. HR reactivity was measured during a baseline period consisting of a 60-s interval preceding experiment onset and during the presentation of affective and neutral video stimuli.

Skin conductance (SC).   SC (in microSiemens, μS) was measured using two 11-mm disposable pregelled Ag/AgCl electrodes placed adjacently on the hypothenar eminence of the palmar surface of the nondominant hand. The signal amplified with a gain of 10 μS/V and sampled online at 250 Hz. SC response amplitudes were quantified as the mean conductance level during the 60-s baseline period preceding experiment onset and during the presentation of affective and neutral video stimuli.

Electromyography (EMG).   EMG signals for the orbicularis oculi (ORB) were sampled at 1000 Hz using two miniature Ag/AgCl electrodes filled with electrode gel and positioned over the ORB muscle under the left eye, using the guidelines of Fridlund and Cacioppo (1986). Raw EMG was rectified and integrated using a 10-ms time constant. Startle blink amplitude was scored off-line by identifying peak EMG deflections (μV) within a time window of 20–120 ms following each startle noise probe. Responses that could not be visually distinguished from baseline activity or occurred outside the postprobe 20- to 120-ms window were scored as missing. Mean baseline orbicularis occuli EMG activity was quantified as the mean activity across the 25-ms interval preceding each startle probe and was subtracted from the peak amplitude occurring within the 20- to 120-ms scoring window following noise probe onset. To establish a common metric for all participants as in prior work (e.g., Vaidyanathan et al., 2009), we converted raw startle magnitude values to T score units by standardizing raw values across trials within each participant. T scores were then averaged to represent startle magnitude values within each video category (violent, erotic, and neutral).

Affective ratings.   Following viewing of each video segment, participants provided self-ratings of their affective reaction to the scene, on dimensions of valence (1 = *unpleasant* to 7 = *pleasant*), arousal (1 = *calm/relaxed* to 7 = *aroused/tense*), and fear (1 = *not at all* to 7 = *very much*). Participants also rated scenes on violent and erotic content (0 = *not at all* to 9 = *very much*). After the presentation of violent scenes, participants rated how sad the scene made them (1 = *not at all* to 7 = *very much*) and also responded to four items (e.g., "I felt sorry for the victim of violence"; 0 = *strongly disagree* to 4 = *strongly agree;* α = .94) designed to measure how much they sympathized with the victim of violence (Fanti, Kyranides, et al., 2015).

Procedure

Upon arrival at the lab, participants were briefed about the procedure and provided consent. Participants were then seated in a padded reclining chair, fitted with the physiological sensors, and instructed to relax in order to check the effectiveness of recordings. Baseline physiological activity was recorded for a 60-s period while participants viewed a blank screen. Next, a fixation point appeared in the center of the screen for 5 s, followed by the video scene. Following each scene, participants entered their self-report ratings using a compact keyboard placed by their dominant hand. Participants viewed a total of 18 video scenes, which were pre-

sented in a randomized order, with the constraint that no two scenes of the same type appeared in sequence. After the experiment, physiological sensors were removed and participants were debriefed.

Results

TriPM Boldness was correlated to a moderate degree with Meanness in the current study ($r = .48$, $p < .001$) and to a modest degree with Disinhibition ($r = .29$, $p < .01$), whereas scores on TriPM Meanness and Disinhibition were more highly correlated ($r = .66$, $p < .01$). As shown in Table 1, the ICU Callous–Unemotional scale completed during adolescence uniquely predicted TriPM Meanness ($\beta = .44$, $p < .01$) longitudinally. At the zero-order level, all TriPM scales were positively associated with Impulsivity APSD subscale, which predicted both disinhibition and meanness across time. The Narcissism scale of the APSD was correlated with all TriPM scales at the zero-order level but uniquely predicted meanness in the regression model ($\beta = .39$, $p < .01$).

Table 1 shows the results from the hierarchical linear regression analyses for criterion variables assessed using self-report questionnaires during adulthood, and Table 2 shows results from analyses for experimental measures as outcomes. In Step 1 of each hierarchical linear regression model, we controlled for youth psychopathic traits, including narcissism, impulsivity, and CU traits. In Step 2, we added TriPM dimensions of boldness, disinhibition, and meanness as predictors, thereby evaluating associations between TriPM dimensions and outcomes above and beyond adolescent assessed psychopathic traits. For comparison purposes, zero-order correlations are presented in the tables, along with standardized regression coefficients controlling for variance in common among the three TriPM scales without controlling for adolescent psychopathic traits. All variables showed acceptable skewness and kurtosis except for the conduct disorder variable, which was positively skewed (skewness = 2.193), for which we used log-linear transformation (skewness = .11).

Associations With Questionnaire Measures

Aggression, anger, and hostility.   Impulsivity was the only adolescent-assessed factor uniquely related to physical aggression, whereas narcissism was uniquely associated with increased anger and hostility. Consistent with hypotheses, TriPM Disinhibition demonstrated the strongest unique associations with BPAQ physical or verbal aggression, anger and hostility, with TriPM Meanness also contributing to the prediction of hostility to a more modest degree ($\beta = .28$). Notably, scores on TriPM Boldness were unrelated to anger but were inversely associated with hostility. Associations between these measures and TriPM dimensions remained unchanged after controlling for adolescent psychopathic traits.

Psychopathology.   Adolescent-assessed narcissism and impulsivity were associated with increases in conduct disorder and ASPD during adulthood, which was not true for CU traits. Further, all TriPM dimensions showed positive correlations with conduct disorder and ASPD. After accounting for associations among the TriPM scales in the context of regression analyses, both meanness and disinhibition predicted conduct

Table 1
Adolescent and Adult Psychopathic Traits Predicting Self-Report Measures (N = 99)

	Step 1: Adolescence				Step 2: Young adulthood			
Scale and subscale	APSD: Narcissism (r/β)	APSD: Impulsivity (r/β)	ICU: Callous–Unemotional (r/β)	R^2	TriPM: Boldness (r/β1/β2)	TriPM: Disinhibition (r/β1/β2)	TriPM: Meanness (r/β1/β2)	ΔR^2
APSD: Narcissism					**.25**/.03	**.43**/.16	**.51**/.39	.27
APSD: Impulsivity					**.26**/.07	**.43**/.25*	**.45**/.24*	.24
ICU: Callous–Unemotional					.18/−.05	**.33**/.05	**.45**/.44	.21
BPAQ: Physical Aggression	**.27**/.11	**.38**/.31	.21*/.04	.15	.16/−.05/−.04	**.62**/**.57**/.54	**.45**/.09/.07	.25
BPAQ: Verbal Aggression	**.29**/.17	**.31**/.21	.20/.04	.12	.09/−.13/−.11	**.68**/**.70**/.72	**.43**/.03/.01	.37
BPAQ: Anger	**.38**/.32*	.20/−.02	**.29**/.16	.16	.18/.06/.07	**.40**/**.36**/.33*	**.30**/.03/−.13	.06
BPAQ: Hostility	**.42**/.27*	**.38**/.20	**.33**/.14	.23	.14/−.18*/−.16*	**.71**/**.54**/.53	**.61**/**.34**/.28*	.34
ASRI-4: Conduct Disorder	**.44**/.22*	**.49**/.34	**.35**/.12	.31	**.32**/.05/.05	**.63**/**.42**/.36	**.60**/**.30**/.19	.19
ASRI-4: ASPD	**.45**/.24*	**.54**/.41	**.30**/.03	.34	**.42**/.14/.08	**.72**/**.48**/.36	**.69**/**.30**/.13	.17
STAI: Trait Anxiety	.22*/.16	.22*/.15	.10/−.03	.06	−.16/**−.31**/−.30	**.51**/**.64**/.66	.21*/−.07/−.10	.33
ERQ: Reappraisal	.02/.10	.01/.07	−.20/−.27*	.06	.11/.24*/.23*	−.03/.13/.14	−.15/**−.36***/−.37*	.07
ERQ: Suppression	.23*/.19	.07/−.13	**.28**/.26*	.11	.11/.01/.04	**.29**/.24*/.29*	.23*/.08/−.04	.06

Note. In Step 1 in the hierarchical regression analyses, narcissism, impulsivity, and callous unemotional traits were entered as predictors (see β). In Step 2 of the hierarchical regression analyses, boldness, disinhibition, and meanness were entered as predictors to examine the predictive validity of the triarchic model above and beyond adolescent measures (see β2). For comparison purposes, we also include regression analyses without controlling for adolescent psychopathic traits (see β1). Zero-order correlations (*r*) reflect bivariate correlations for each subscale score and criterion measure. Final beta weights and change in R^2 are also shown. APSD = Antisocial Process Screening Device (youth version); ICU = Inventory of Callous–Unemotional traits; TriPM = Triarchic Psychopathy Measure; BPAQ = Buss and Perry Aggression Questionnaire; ASRI-4 = Adult Self-Report Inventory–4; STAI = State–Trait Anxiety Inventory; ERQ = Emotion Regulation Questionnaire. Bold font entries are significant at the $p < .01$ level.
* $p < .05$.

disorder and ASPD, but only disinhibition uniquely predicted these variables after controlling for adolescent psychopathic traits. Regarding anxiety, only adolescent-assessed narcissism and impulsivity were positively associated with trait anxiety at the zero-order level. As hypothesized, scores on TriPM Boldness were inversely associated with trait anxiety when controlling for overlap with TriPM scales and adolescent psychopathic traits. By contrast, scores on TriPM Disinhibition were positively associated with anxiety. The zero-order association between meanness and anxiety dropped to nonsignificance in regression analyses, indicating that it reflected variance in common with disinhibition.

Clinically relevant traits. Adolescent-assessed CU traits and adult-assessed disinhibition were positively associated with ERQ Suppression. By contrast, CU traits and meanness each showed negative associations with ERQ reappraisal (βs = −.27 and −.37, respectively), suggesting similar associations across development. Boldness was positively associated with reappraisal, even after controlling for adolescent psychopathic traits.

Associations With Emotional Ratings

Significant zero-order correlations between the psychopathy scales and emotional rating variables were evident only for the violent scenes (see Table 2), with the only exception being a negative correlation between narcissism and erotic content that did not hold in regression analysis. In regression analyses, narcissism and CU traits showed positive relations with valence during violent films, whereas CU traits was the only adolescent-assessed variable negatively associated with arousal, fear, sympathy, sadness, and perceived violence of scene content during violent films. All TriPM scales showed positive correlations with rated valence and negative correlations with rated arousal, sympathy, and sad-

ness during violent scenes, but only Boldness and Meanness showed negative associations with ratings of fearfulness and perceived violence of scene content. Findings from the regression analyses indicated a unique predictive contribution of adult meanness in particular to higher ratings of positive valence for violent scenes and unique contributions of boldness to lower ratings of fear and violent content, above and beyond adolescent psychopathic traits. However, negative associations between adult meanness with sympathy to victims and sadness dropped to nonsignificance after controlling for adolescent traits, reflecting variance in common with adolescent CU traits.

Associations With Physiological Measures

For all physiological measures, difference scores were computed by subtracting physiological activity during neutral scenes from activity during violent and erotic scenes. Hence, in the reported analyses (see Table 2), responses to neutral scenes are treated as the control condition.

Autonomic measures. All three TriPM scales showed negative zero-order correlations with both HR and SC measures at baseline, although only adolescent-assessed impulsivity was associated with baseline heart rate. Regression analyses for these measures revealed that boldness alone was uniquely predictive of lower baseline HR, even after controlling for adolescent psychopathic traits. None of the associations with baseline SC achieved significance in regression analysis. The only association with autonomic reactivity during the violent video scenes was a negative association between boldness and HR reactivity to violent scenes, evident both in zero-order and regression analyses. For erotic scenes, the only association that emerged as significant was between APSD impulsivity and heart rate reactivity.

Table 2
Correlation and Standardized Beta Weights Predicting Lab Ratings and Physiological Measures (N = 88)

	Step1: Adolescence				Step2: Young adulthood			
Variable	APSD: Narcissism (r/β)	APSD: Impulsivity (r/β)	ICU: Callous–Unemotional (r/β)	R^2	TriPM: Boldness (r/β1/β2)	TriPM: Disinhibition (r/β1/β2)	TriPM: Meanness (r/β1/β2)	ΔR^2
Violent video ratings								
Valence	**.36**/.28*	.11/−.17	**.38**/**.33**	.20	**.32**/.15/.17	.23*/−.15/−.10	**.42**/**.46**/.31*	.10
Arousal	−.09/.04	−.14/−.05	−.25*/−.24*	.06	−.21*/−.12/−.14	−.26*/−.18/−.20	−.25*/−.06/−.02	.06
Fear	−.18/.02	−.19/−.04	−.39*/−.39	.16	**−.40**/**−.34**/−.31	−.15/.07/.10	−.27*/−.16/.12	.08
Sympathy to victims	**−.30**/−.19	−.21*/−.02	**−.34**/−.26*	.15	**−.31**/−.16/−.17	**−.28**/−.01/−.02	**−.39**/−.31*/−.18	.07
Sadness	**−.30**/−.15	−.25*/−.06	**−.37**/−.28*	.17	**−.32**/.20*/−.21	−.25*/−.01/.01	**−.34**/−.25*/−.05	.06
Violent content	−.27*/−.18	−.12/.10	**−.34**/−.30*	.14	**−.29**/−.22*/−.23*	−.20/−.05/−.07	−.25*/−.12/.05	.05
Erotic video ratings								
Valence	.03/.16	−.16/−.21	−.09/−.07	.04	−.01/−.01/−.04	−.11/−.20/−.17	−.02/.12/.13	.02
Arousal	−.20/−.16	−.11/.02	−.18/−.12	.05	.02/.01/.02	−.06/−.15/−.13	.01/.11/.13	.04
Fear	−.04/−.03	.07/.18	−.16/−.22	.05	.01/.01/−.02	−.07/−.16/−.21	.01/.12/.20	.02
Erotic content	−.23*/−.19	−.13/.01	−.18/−.11	.06	−.14/−.10/−.12	−.13/−.08/−.09	−.12/−.02/.10	.02
Baseline physiology								
Heart rate (HR) level	−.19/−.20	−.22*/−.21	−.10/.08	.10	**−.28**/−.23*/−.22*	−.22*/−.14/−.09	−.21*/−.01/−.01	.06
Skin conductance (SC) level	.04/.06	.01/−.06	.11/.15	.03	−.23*/−.16/−.13	−.20*/−.09/−.19	−.21*/−.02/−.10	.07
Violent video physiology								
HR difference (vs. neutral)	−.15/−.16	−.04/.06	−.08/−.03	.03	−.24*/−.23*/−.22*	−.06/−.03/−.03	−.07/.06/.15	.04
SC difference (vs. neutral)	−.09/−.06	−.01/.09	−.14/−.16	.03	−.08/−.04/−.04	−.05/.09/.06	−.13/−.19/−.15	.01
Startle potentiation (vs. neutral)	**−.28**/−.14	−.22*/−.04	**−.34**/−.25*	.14	−.10/.03/.05	−.24*/−.13/−.11	**−.26**/**−.29**/−.09	.01
Erotic video physiology								
HR difference (vs. neutral)	.14/.01	**.30**/**.31**	.10/−.04	.09	.01/−.08/−.11	.15/.09/.01	.15/.13/.05	.01
SC difference (vs. neutral)	−.04/−.02	.02/.09	−.12/−.15	.02	−.06/−.03/−.05	−.03/.06/.02	−.08/−.10/−.08	.01
Startle potentiation (vs. neutral)	−.02/−.07	.14/.21	−.06/−.12	.04	−.05/−.08/−.10	−.05/−.13/−.20	.02/.14/.15	.03

Note. In Step 1 in the hierarchical regression analyses, narcissism, impulsivity, and callous–unemotional traits were entered as predictors to examine the predictors (see β). In Step 2 of the hierarchical regression analyses, boldness, disinhibition and meanness were entered as predictors to examine the predictive validity of the triarchic model above and beyond adolescent measures (see β2). For comparison purposes, we also include regression analyses without controlling for adolescent psychopathic traits (see β1). Zero-order correlations (*r*) reflect bivariate correlations for each subscale score and criterion measure. Final beta weights and change in R^2 are also shown. APSD = Antisocial Process Screening Device (youth version); ICU = Inventory of Callous–Unemotional traits; TriPM = Triarchic Psychopathy Measure. Bold font entries are significant at the $p < .01$ level.
* $p < .05$.

Startle reflex modulation. In accordance with prior research (Kyranides et al., 2015), startle modulation was examined separately for violent and erotic video scenes, each relative to neutral scenes. Correlational analyses focusing on startle modulation scores (violent minus neutral, erotic minus neutral) revealed that narcissism, impulsivity, CU, disinhibition, and meanness were negatively associated with startle potentiation from violent, but not erotic, scenes relative to neutral scenes. However, only adolescent-assessed CU traits uniquely predicted startle potentiation for violent scenes (β = −.25). When not controlling for adolescent psychopathic traits, adult meanness significantly predicted startle potentiation for violent scenes (β = −.29), indicating that this association was attributable to variance in common with adolescent CU traits.

Discussion

The current study sought to examine relationships of boldness, meanness, and disinhibition with various trait-dispositional, behavioral, and physiological variables. Overall, results from the current study were largely consistent with a priori hypotheses, particularly those from regression analyses highlighting distinct predictive relations for each triarchic dimension. It is important to note that the majority of the associations between TriPM scales and outcome measures remained significant after controlling for adolescent psy-

chopathic traits, including CU traits, impulsivity, and narcissism. Of importance, the associations identified for adolescent psychopathic traits with TriPM dimensions, anxiety, antisocial behavior, and physiological measures represent prospective associations over a period of 4 years from adolescence to early adulthood. The present study provides, in addition to this novel developmental aspect, new evidence regarding important trait-dispositional and behavioral correlates of the triarchic model constructs and adds to existing knowledge regarding associations between the triarchic dimensions and physiological measures, above and beyond adolescent psychopathic traits.

Report-Based Clinical Criterion Variables: Findings and Implications

The observed longitudinal associations for meanness with CU traits, and disinhibition with impulsivity, were compatible in each case with prior work (Fanti, Kyranides, et al., 2016; Hall et al., 2014; Sellbom & Phillips, 2013) and provide evidence for developmental correspondence between these measures. We did not find, consistent with findings from Drislane et al. (2014), an association for boldness with APSD narcissism at the younger assessment time, which we attribute to the APSD indexing a more "vulnerable" variant of narcissism—as opposed to the "grandiose" variant indexed by the widely used Narcissistic Personality Inven-

tory, which exhibits a moderate positive association with TriPM Boldness (Stanley et al., 2013).

As expected, disinhibition was the only adult psychopathy facet that predicted physical and verbal aggression, and these associations remained significant above and beyond the association for adolescent impulsivity with aggression. The positive association of disinhibition with aggression may be explained by the higher hostility and anger of high-disinhibited individuals toward others coupled with their weak behavioral restraint and impaired affective control. Similar to results in Fanti, Kyranides, et al. (2016), boldness was negatively associated with hostility, which may be an important attribute distinguishing boldness from both meanness and disinhibition, each of which showed positive relations with hostility, even after controlling for adolescent psychopathic traits. Hostility can be viewed as a blend of anger and social disengagement or distrust, characteristics associated with disinhibition and meanness, respectively. The low hostility of individuals high on boldness might explain their lower propensity to engage in aggressive acts. The only adolescent psychopathic dimension that was positively associated with anger and hostility was narcissism, which can be explained by associated difficulties in interpersonal adaptation and emotional disengagement from others (Krstic, Knight, & Robertson, 2015).

In addition to aggressive behavior, impulsivity and disinhibition were associated with conduct disorder and ASPD symptoms, as defined in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; American Psychiatric Association, 1994), agreeing with prior work (Hall et al., 2014) and demonstrating the importance of both adolescent and adult impulsive or disinhibited traits for predicting antisocial behavior. Adolescent assessed narcissism, but not CU traits, also predicted these forms of antisocial behavior, whereas the associations for meanness with conduct disorder and ASPD dropped to nonsignificance after controlling for adolescent psychopathic traits. These findings are interesting especially because CU traits are the only psychopathic dimension currently considered as a specifier for conduct disorder symptoms (APA, 2013). The nonsignificant association of boldness with antisocial behavior accords with recent evidence from adult offender samples indicating that boldness does not contribute to the prediction of ASPD (Wall et al., 2015).

TriPM boldness and disinhibition exhibited opposing associations with measures of anxiety. These associations reflect contrasting relations with stress reactivity for these two psychopathy facets (Drislane et al., 2014; Hall et al., 2014; Patrick et al., 2009). Boldness entails emotional resilience and social efficacy, attributes that likely account for its negative association with anxiety. The good psychological adjustment and adaptive tendencies of high-bold individuals were evidenced by, along with lower anxiety, positive associations of boldness with more-frequent use of positive affect–regulation strategies such as cognitive reappraisal. The increased use of cognitive reappraisal indicates that high-bold individuals are able to control their emotions and remain calm when faced with stressful situations, a defining characteristic of boldness (Patrick et al., 2009). The negative association between the use of reappraisal strategies and CU traits during adolescence and meanness during adulthood indicates that individuals high in these traits use adaptive strategies less often across development. By contrast, the finding of a positive association between use of affective suppression and TriPM Disinhibition scores suggests that

this facet of psychopathy is associated with a more primitive strategy for coping with stress that has adverse health consequences (Gross & John, 2003) and can explain their more disinhibited and explosive nature of their reactions. Contrary to our expectations, adolescent-assessed CU traits but not impulsivity were positively associated with affective suppression.

Physiological and Behavioral Criterion Variables: Findings and Implications

The negative association between boldness and rated fear in relation to violent scenes in the current study is consistent with the notion of boldness as reflecting the low end of a bipolar dimension of fearlessness versus fear (Kramer et al., 2012). Boldness was also associated negatively with ratings of violent content in relation to scenes of this type, which could reflect either generally reduced distress in relation to negative events or heightened positive affect associated with boldness (Patrick & Drislane, 2015). Similarly, TriPM meanness and adolescent CU traits were each associated positively with ratings of higher positive valence for violent scenes, which is in line with the lack of empathy associated with these constructs. Furthermore, CU traits were also associated with lower ratings of sadness and sympathy for victims and reduced ratings of fear and arousal in response to violent scenes. These findings provide evidence for the construct validity of the ICU Callous–Unemotional scale, indicating that individuals with high scores on this measure during adolescence are unresponsive and unmoved by affective situations involving pain and distress (Fanti, Kyranides, et al., 2016; Frick et al., 2014). The associations of meanness with lower sadness and sympathy to victims dropped out of significance after controlling for adolescent psychopathic traits, providing evidence for the shared variance with the CU construct.

Notably, low resting heart rate and autonomic hypoarousal, which have been interpreted as factors predisposing toward pursuit of stimulating experiences to enhance tonic arousal, were uniquely associated with boldness (see Raine, 2002, for a review). Further, autonomic hypoarousal and low resting heart rate have been described as reflecting fearlessness, lack of anxiety, and behavioral inhibition (Raine, 2002). These findings suggest that the fearlessness and low anxiety of individuals high on boldness might be explained by their low resting HR and reduced cardiac reactivity to aversive stimuli and indicate that autonomic underarousal may serve an important biological indicator of boldness. Adolescent impulsivity was positively associated with heart rate reactivity for erotic scenes, which might be related to the hyperarousal characterizing impulsive individuals (Fanti, Panayiotou, Kyranides, & Avramides, 2016).

In addition, adolescent CU traits were longitudinally associated with reduced blink-startle potentiation for violent videos—replicating prior work documenting startle potentiation deficits among children and adults high on CU traits (Fanti, Panayiotou, Kyranides, & Avramides, 2016; Fanti, Panayiotou, Lazarou, et al., 2016). This lack of enhanced startle reactivity to noise probes during viewing of aversive scenes is indicative of deficient activation of the brain's defensive system—consistent with reports of high-CU individuals' being low in sensitivity to aversive events and distress cues (Fanti, Panayiotou, Lazarou, et al., 2016; Frick et al., 2014) and lacking in amygdala reactivity to fearful face stimuli (Viding et al., 2012). Our findings thus dovetail with prior work by

other investigators pointing to a unique deficit in the processing of cues pertaining to victims' distress among individuals high on CU traits. Meanness was also associated with reduced startle potentiation to violent stimuli, and this association was no longer significant after taking developmental associations with adolescent CU traits into account, again providing support for the similarity of the two measures.

Consistent with our findings, this deficit in startle reactivity has also been reported for adults scoring high on the PCL–R affective–interpersonal, but not the impulsive antisocial, features of psychopathy (Patrick, 1994; Vanman et al., 2003). However, in contrast with studies showing reduced startle potentiation during aversive picture-viewing for adult nonoffenders high in boldness (e.g., Benning et al., 2005; Dvorak-Bertsch et al., 2009; Vaidyanathan et al., 2009), we did not find a significant association for this triarchic dimension with startle modulation to violent scenes. It could be the case that effects for boldness occur more robustly in relation to specifically fear-inducing scenes (e.g., spider/snake or attack scenes). Vaidyanathan et al. (2009) reported, as evidence for this, a greater effect of trait fear (i.e., boldness-reversed) on magnitude of startle potentiation for threat compared to mutilation and victim scenes.

Strengths, Limitations, and Conclusions

A major strength of the current work is the collection of longitudinal data across a 4-year follow-up duration, from adolescence to young adulthood, and the project's use of multimethod assessment, including physiological, behavioral, and self-report measures, to index the constructs under investigation. This is the first study to our knowledge that (a) elucidates physiological correlates of the triarchic model, providing further important clarification of their nomological networks, which up to this point have been limited mainly to associations with other psychopathy measures and personality traits, and (b) provides evidence for likely consistency over time of psychopathic constructs. At the same time, current findings must be considered in light of certain limitations. The sample size was moderate, but considering the large number of measures collected as well as the experimental nature of the second part of the study, a larger sample was difficult to obtain. Further, psychopathic traits were assessed on the basis of self-report instruments. Mitigating this issue somewhat, longitudinal assessments provided support for developmental links between adolescent and adult psychopathy. However, despite these limitations, the current study is novel in its approach to studying the relationship between psychopathy in young adulthood after controlling for psychopathy in adolescence. Future research, using a larger and more-diverse sample from both community and clinical populations and across longer time spans, is needed to replicate and extend these findings.

In sum, current findings support the proposal that the three dimensions of the triarchic model reflect distinct categories of psychopathic traits that relate differentially to clinical variables and physiological measures. Informing the debate concerning the role of boldness in defining psychopathy, boldness was not predictive of ASPD symptoms, although it predicted low anxiety and fear, characteristics that have been linked with the construct of psychopathy. In addition, findings from the lab video-viewing assessment of the current study suggest that different physiological measures may serve as biological indicators of distinct dimensions of the triarchic model, with low resting heart rate and reduced cardiac response to violent stimuli being uniquely associated with boldness after controlling for adolescent psychopathic traits, and low startle potentiation to violent stimuli being uniquely associated with CU traits and meanness. Findings from this work also contribute to developmental theories of psychopathic traits, by providing evidence for continuity of early impulsivity with later disinhibition, and early CU traits with later meanness. Taken together, these findings provide evidence for the value of a multidomain approach to assessment for clarifying neurobiological mechanisms of psychopathic tendencies that can inform prevention and treatment efforts. Current results have the potential to inform treatment planning for individuals differentiated on psychopathic dimensions, highlighting in particular the need to consider variation in general arousal and emotional reactivity in formulating individualized interventions.

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