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Elaborating on the Longitudinal Measurement Invariance and Construct Validity of the Triarchic Psychopathy Scales from the Multidimensional Personality Questionnaire

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Abstract

Because the construct of psychopathy is of chief interest across different disciplines, spanning developmental, clinical, and forensic psychology, its assessment bears far-reaching implications. One prominent contemporary conceptualization of psychopathy, the Triarchic Model, posits that a psychopathic personality encompasses three phenotypic constructs: boldness, meanness, and disinhibition. Recently, triarchic scales have been derived based on items from the Multidimensional Personality Questionnaire (MPQ), and the psychometric characteristics of this approach (MPQ-triarchic; MPQ-Tri) are promising. The present study examined the longitudinal measurement invariance and the construct validity of the MPQ-Tri scales in a large and diverse high-risk sample (N = 716) across four time points from age 16 to age 25. First, we report and discuss implications of confirmatory and exploratory factor analyses of the MPQ-Tri scales. Next, we report evidence for longitudinal configural and partial scalar invariance. In addition, in line with previous studies, MPQ-Boldness showed relatively higher levels of rank-order and mean-level stability compared to MPQ-Meanness and Disinhibition. Finally, in terms of construct validity, the MPQ-Tri scales showed a pattern of association with external correlates across internalizing and externalizing domains that were largely in line with theoretical expectations. One partial exception concerned the limited discriminant validity of the MPQ-Meanness and Disinhibition scales. On balance, the present findings suggest that the MPQ-Tri scales fulfill their intended purpose, with some noted limitation, and provide grounds for the use of the MPQ-Tri scales in developmentally-informed studies on the etiology and consequences of psychopathy.

Keywords: Psychopathy; psychopathic personality; triarchic model; boldness; meannes; disinhibition; Structural Equation Modeling

Public Scientific Statement: The present study elaborated on the assessment of the triarchic (Tri) psychopathy constructs (boldness, meanness, and disinhibition) using the Multidimensional Personality Questionnaire (MPQ), a normal-range personality measure. We provide support for the utility of MPQ-Tri scales in longitudinal studies that examine the development of psychopathy, and offer recommendations for their use.

Elaborating on the Longitudinal Measurement Invariance and Construct Validity of the Triarchic Psychopathy Scales from the Multidimensional Personality Questionnaire

Psychopathy is a personality disorder characterized by interpersonal antagonism, behavioral disinhibition, and distinctive affective dysfunctions (Hare & Neumann, 2008; Patrick et al., 2009). Different structural models of psychopathic personality have been proposed, all of which describe traits in the domains of interpersonal and affective functioning, in addition to behavioral dysregulation and antisocial tendencies. Some of these features are similarly emphasized in different conceptualizations of this disorder, such as affective callousness, lack of empathy and remorse, interpersonal dominance, aggression, suboptimal decision-making, and poor impulse control. However, different models of psychopathy vary in the emphasis they place on traits such as fearlessness, lack of anxiety, and overt antisocial behavior as defining features of this disorder (Crego & Widiger, 2015; Hare & Neumann, 2010; Lilienfeld et al., 2012; Lynam & Miller, 2012; Skeem & Cooke, 2010). Despite controversies on the optimal conceptualization and operationalization of psychopathy, there is general agreement that a better conceptualization of the psychopathy construct is highly germane for both mental health and the criminal justice contexts, largely due to the deleterious effects that psychopathic individuals often bear on others and society at large (DeLisi, 2009; Reidy et al., 2015). The present study sought to examine the structure, longitudinal measurement invariance and temporal stability across late adolescence and young adulthood, as well as the construct validity of a psychopathy measure recently developed (Brislin et al., 2015) based on items drawn from the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982).

The triarchic model of psychopathy was developed in an attempt to reconcile differing conceptualizations of psychopathic personality (Patrick et al., 2009). Integrating historical and contemporary perspectives, this model characterizes psychopathy in terms of three broad phenotypic constructs: (1) *boldness*, which encompasses fearlessness social dominance and tolerance for stress, danger, and uncertainty; (2) *meanness*, defined as a pattern of aggressive resource-seeking entailing interpersonal detachment, callous disregard for others, and predatory aggression; and (3) *disinhibition*, which entails low frustration tolerance, poor impulse control and emotion regulation, as well as a general

propensity towards externalizing symptomatology (Patrick et al., 2009; Patrick & Drislane, 2015). The triarchic model specifies that boldness is theoretically and empirically orthogonal to disinhibition and moderately correlated with meanness due to shared temperamental fearlessness. In turn, meanness and disinhibition conceptually share a substantial degree of overlap largely due to shared antagonistic and aggressive tendencies, although of different nature and form (e.g., proactive and reactive aggression, respectively). Yet, it is in the presence of elevations in at least two of these three components that the most pathological forms of psychopathic personality occur (Patrick et al., 2009).

More concretely, Patrick et al. (2009) argued that the clinical syndrome of psychopathy entails behavioral disinhibition in combination with either boldness or meanness. The triarchic component of boldness in itself captures personality features, such as social poise and resilience to stress, that are indicative of positive adjustment, at least in terms of short-term interpersonal functioning (Lilienfeld et al., 2012, 2015). In addition, boldness traits might help differentiate psychopathy from other forms of psychopathology (including antisocial personality disorder), to the extent that they are protective against major forms of (internalizing) psychiatric disorders (Patrick et al., 2009; Sellbom et al., 2018; Wall et al., 2014). In contrast, meanness and disinhibition represent clearly maladaptive trait domains with overlapping but partly distinct nomological networks, with meanness being associated with more callous and predatory forms of externalizing traits, and disinhibition characterized by stronger associations with negative affect and irritability, poor effortful control and self-regulation, difficulties adapting to changing environmental circumstances, and poor decision making (Patrick et al., 2009; Patrick & Drislane, 2015).

Despite debates about the relevance of boldness for the construct of psychopathy (Crego & Widiger, 2015; Lilienfeld et al., 2012; Lynam & Miller, 2012; Sellbom, 2018), the triarchic model has quickly gained traction in the psychopathy field. One attractive feature that has plausibly enhanced the popularity of the triarchic model of psychopathy is that it was developed as a construct-based model not tied to any particular measure. A Triarchic Psychopathy Measure (TriPM; Patrick, 2010) was developed to assess boldness, meanness, and disinhibition based on parent inventories. Yet, the three triarchic components are conceptualized as open constructs and, presumably, can be measured using items from a

variety of existing instruments assessing psychopathic personality, basic personality traits, or personality pathology. Accordingly, triarchic psychopathy scales have been developed from a multitude of broadband self-report questionnaires, including but not limited to the NEO Personality Inventory (Drislane et al., 2018), the Personality Inventory for DSM-5 (Drislane et al., 2019), and the Multidimensional Personality Questionnaire (MPQ; Brislin et al., 2015, 2017). This possibility represents an attractive feature because it allows to conduct research on psychopathy (at least based on its triarchic conceptualization) by leveraging existing data that would otherwise be costly and difficult to collect, such as those included in longitudinal datasets, epidemiological studies, and studies involving difficult populations or complex multi-method designs. For example, studying of this sort have been fundamental to investigate the longitudinal trajectories of psychopathic traits over a large time-span, which may serve the purpose of identifying predictors and outcomes related to different developmental trajectories of psychopathic traits. In relation to the trait domains included in the triarchic model of psychopathy, previous research has shown that traits belonging to all three domains tend to be relatively stable over time, though meanness and disinhibition traits have shown to decline over time more so than boldness traits (Blonigen et al., 2006), in line with findings obtained with other methods of operationalization of psychopathic traits (e.g., Neumann et al., 2011; Ray, 2018).

As an illustrative example, researchers have leveraged the MPQ as a means to recover triarchic psychopathy scales (Brislin et al. 2015, 2017). This approach is valuable because of the MPQ's prevalence across numerous large-scale, longitudinal, and behavioral-genetics studies. Through a construct-rating and psychometric refinement approach (see Brislin et al., 2015, for more details about this procedure), Brislin et al. (2015) identified 54 items from the original MPQ (also included in the MPQ-Brief Form) that could serve as indicators for an operationalization of the triarchic components. In a confirmatory factor analysis (CFA) a three-correlated-factor model yielded adequate absolute fit to the data (root-mean-square error of approximation [RMSEA] = .07) and marked improvement in model fit based on Chi-Square difference compared to the baseline model. Because the RMSEA of the baseline model was lower than .158 (Kenny, 2012), Brislin et al. (2015) reasoned that incremental fit indices

would be of limited added value and did not report them for the three-correlated factor model. More recently, Collison et al. (2020) examined the factor structure of the MPQ-Tri scales in an MTurk sample. The a-priori three-factor model had adequate RMSEA value but inadequate CFI and TLI values, as did the alternative – five-factor – solution derived in the same study based on exploratory factor analysis. This and other studies on the factor structure of the triarchic psychopathy scales based on a variety of inventories (e.g., Roy et al., 2020) have led researchers to raise concerns about the tenability of this model and raised the possibility that boldness, meanness, and disinhibition are better represented as multidimensional constructs.

However, it is worth noting that other researchers have argued, for several reasons, that a focus on traditional model fit indices ubiquitous in CFA approaches may not be ideal to examine the internal structure of triarchic psychopathy measures in general, and of the MPQ-Tri scales, in particular (Patrick et al., 2020; Somma et al., 2019). A CFA approach operates under strong assumptions of simple structure, which is often unrealistic when applied to complex personality constructs (Hopwood & Donnellan, 2010; Sellbom & Tellegen, 2019). Arguably, this is especially true for item-based factor scales, as the triarchic psychopathy scales that consist of selections of items drawn from broader multidimensional inventories (Patrick et al., 2020). On the other hand, although a fully exploratory framework such as exploratory structural equation modeling (ESEM) may allow to account for item cross-loadings between conceptually overlapping domains (e.g., meanness and disinhibition), it would at the same time expand the scope of error due to additional sources of item covariation patterns such as item characteristics (Morey, 2019). Especially when items are selected from parent inventories designed for other purposes, and when researchers want to evaluate a specific a-priori structure (such as Brislin et al.'s [2015] MPQ-Tri scales), an exploratory framework may help address some limitations of a strictly confirmatory approach, but lead to different sources of model misfit (Somma et al., 2019). In the specific case of the MPQ-Tri scales, the model fit of both CFA and ESEM approaches may presumably be influenced also by the original MPQ

scales from which the MPQ-Tri items were derived. Given these considerations,[1] the focus of the present investigation was not exclusively on model fit but also on other issues of substantive relevance that could be addressed within a measurement framework, such as the longitudinal measurement invariance of the MPQ-Tri scales.

Besides its factor structure, other important considerations in terms of reliability and construct validity are necessary when evaluating the extent to which the MPQ-Tri scales fulfill their intended purpose (Sellbom & Tellegen, 2019). In two studies, Brislin et al. (2015, 2017) evaluated the reliability and construct validity of the MPQ-Triarchic (MPQ-Tri) scales across samples of undergraduate students, community participants, incarcerated individuals, and male offenders in substance use treatment. Overall, their preliminary findings revealed adequate internal consistency of the three MPQ-Tri scales (αs $\geq$ .70; with the exception of α = .63 for MPQ Boldness in the female inmate sub-sample) and associations with external correlates that were largely in line with theoretical predictions. In particular, MPQ Boldness was associated with both positive adjustment features (e.g., low anxiety and depression, high positive affect and social engagement, high extraversion), and maladaptive tendencies (e.g., narcissism, antagonism, risk-taking). In contrast, MPQ Meanness and Disinhibition were uniquely related to maladaptive correlates. Meanness was positively related to proactive aggression, violence, antisocial personality disorder (ASPD) symptoms, antagonism and interpersonal detachment. Disinhibition was positively associated with anger expression, reactive aggression, ASPD symptoms, substance use problems, negative affect and internalizing symptoms such as anxiety and depression. Notably, comparisons across gender revealed only few negligible differences in the association between MPQ-Tri scales and external correlates. Based on the promising results from these two studies, Brislin et al. (2017) put forth the intriguing possibility to use the MPQ-Tri scales drawn from large datasets to investigate the "causal bases and developmental course of psychopathy and other high-impact clinical populations" (p. 588).

[1] Addressing these issues in a manner that does justice to the complexity of the topic would go beyond the scope of the present study. Interested readers can refer to Patrick et al. (2020), Roy et al. (2020, 2021), or Somma et al. (2019).

Although studies such as these strongly highlight the utility of the MPQ-Tri scales to measure psychopathic traits, some lingering issues regarding the use of MPQ-Tri scales remain unresolved. First, across the two studies described above, a potential limitation of the MPQ-Tri scales emerged concerning the discriminant validity of the MPQ-Meanness and Disinhibition scales (Brislin et al., 2015, 2017). Specifically, across the six sub-samples, these two scales had consistently moderate-to-large inter-correlations (r_{median} = .54), in line with their conceptually expected overlap. However, the nomological networks of the MPQ-Meanness and Disinhibition scales were largely similar, albeit differences in line with theoretical expectations emerged in magnitude and when controlling for the shared variance between the two scales (see also Collison et al. [2020] for similar results). Thus, the extent to which MPQ-Meanness and Disinhibition assess meaningfully distinct constructs in terms of similarity in the patterns of associations with external correlates needs to be further elucidated. Second, further replications in more diverse samples are warranted to corroborate the generalizability of previous findings (see Brislin et al., 2015). Third, before pursuing the ambitious goals of examining etiological precursors and developmental course of psychopathic traits using the MPQ-Tri scales, the establishment of longitudinal measurement invariance and level of temporal stability of these scales must first be realized.

To address these issues, the present study examined the longitudinal measurement invariance (from adolescence to young adulthood) and the construct validity of the MPQ-Tri scales in a large and diverse high-risk sample across four waves over more than 8 years, that is, from age 16 to age 25 (approximately) with assessments conducted every 3 years. First, we examined the factor structure of the 54 MPQ-Tri items to represent the triarchic psychopathy scales using both CFA and ESEM approaches. Next, we examined the longitudinal measurement invariance of the MPQ-Tri scales as well as their rank-order and mean-level stability over time. Finally, we investigated the within-time construct validity of the MPQ-Tri scales at each time point by examining bivariate and unique (i.e., controlling for the shared variance between MPQ-Tri scales) associations with clinically-relevant correlates. Specifically, among those available in the dataset, and in line with the conceptual and empirical background on the triarchic psychopathy model and its measures reviewed above, we selected indices to capture both the adaptive and

the maladaptive correlates of the triarchic domains, spanning internalizing and externalizing domains, with a specific emphasis on constructs and outcomes that which meanness and disinhibition may differentially be associated (e.g., aggressive behavior, self-regulation, decision making). An overview of the constructs selected, along with the specific measure used and the hypothesized associations is presented in Table 1. We clarify that our hypotheses were mostly based on theoretical expectations about the constructs of boldness, meanness, and disinhibition, rather than being specific to their MPQ-Tri method of operationalization. Taken together, findings from the current study will provide novel information to advance the evidence base available to set the stage for using the MPQ-triarchic scales in developmentally-informed psychopathy research.

Method

Participants

The present study used data from the Center for Education of Drug Addiction Research (CEDAR; https://www.pitt.edu/~cedar/). These data were originally collected for a longitudinal family/high-risk investigation of the etiology of substance use disorder (SUD). Target participants were adult males with or without a diagnosis of SUD who had a 10–12 year old biological child. Target participants with SUD were recruited from substance use treatment programs, social service agencies, public announcements and advertisements on newspapers and radio, as well as random digit telephone calls. To avoid sampling bias, target participants without SUD were recruited using the same method (except for treatment facilities). Exclusion criteria included a history of neurological disorders, schizophrenia or permanent sensory incapacity in the father, or a history of neurological injury requiring hospitalization, intelligence quotient lower than 70, chronic physical disability, permanent sensory incapacity or psychotic disorder in the children. This study was reviewed and approved by the Institutional Review Board of the University of Pittsburgh, and participants provided written informed consent prior to implementing the research protocol. More information on the study protocol are described in published studies (e.g., Tarter & Vanyukov, 2001; Vanyukov et al., 2009).

Although the fathers were originally recruited, data from the children were used for the purpose of the present investigation. Children underwent regular assessments on a large number of individual and environmental features. Here, we used data from the assessment time points when the target participant's children completed the MPQ, that is, when these subjects were aged approximately 16 (3rd time point of the broader longitudinal study), 19, 22, and 25 (6th time point). The current study used data from 784 participants (70.8% males, net unavailable demographic information on 160 participants). Of these, 716 completed at least one MPQ assessment. Information about the number of participants who have completed each MPQ assessment is detailed in Table 2; information about the number of participants who have completed the criterion measures as well as their age is detailed in the supplemental tables online. The majority of participants were European-American (75.8%), 21.2% were African-American, and 3% were of another ethnicity. When completing the first assessment (age 10–11), 1.6% of kids had completed 2nd grade, 13.1% 3rd grade, 28.8% 4th grade, 32.5% 5th grade, 21.8% 6th grade, and 2.1% 7th grade. The majority of children were living with both parents at the time of their inclusion in the study (84.1%), whereas 12.8% and 3.0% were living with their mother only and with their father only, respectively.

Measures

Main Instrument

Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982). The original version of the MPQ were administered to participants at each time point relevant to the current study, including 300 dichotomous (yes/no) items. For the purpose of the present study, we only used the 54 items that form the MPQ-Tri scales developed by Brislin et al. (2015, 2017). A full list of the item number, as well as the corresponding MPQ scale and subscales, is presented in Table 5. Existing evidence on the psychometric properties of the MPQ-Tri scales was reviewed in the Introduction. Internal consistency coefficients and within-time latent correlations for the MPQ-Tri scales in the present study are displayed in Table 3.

Criterion Variables

Dysregulation Inventory (DI; Mezzich et al., 2001). The DI is a 90-item self-report questionnaire that was used to assess self-regulation. It was assessed at each time point used in the present

study. Participants self-reported on their self-regulation skills rating each item on a 5-point Likert scale ranging from 0 (*never true*) to 4 (*always true*). The DI items are summed to produce scores on three subscales: affective dysregulation (28 items; α_{range} = .92–.93), behavioral dysregulation (34 items; α_{range} = .92–.93), and cognitive dysregulation (28 items; α_{range} = .76–.80).

Alcohol and Marijuana Use. Two indices of alcohol and marijuana use were included in the present study analyses for the time points 3 to 5. First, the dataset included a single-item inquiring whether participants had ever used alcohol or marijuana, with a yes/no response. Second, we used the two corresponding items from the Drug Use Screening Inventory (DUSI; Tarter, 1990), inquiring about frequency of use of alcohol and marijuana during the past year, on a 5-point Likert scale ranging from 0 ("*0 times*") to 4 ("*More than 20 times*").

Drug Use Screening Inventory-Absolute Problem Density Profile (ABS). The ABS is a checklist that contains several indices of maladjustment related to substance use or other problematic areas, developed in the CEDAR dataset based on self-reported questions to items contained in the DUSI (Tarter, 1990). Specifically, these dichotomous (yes/no) items inquire about problems in the following areas: substance use (degree of involvement; severity of consequences; 15 items); behavioral problems (social isolation; anger; acting-out; 20 items); health status (accidents, injuries, illnesses; 10 items); psychiatric disorders (anxiety, depression, psychotic symptoms; 20 items); social competence (social interactions and social skills; 14 items); family system (conflict, supervision; 14 items); school performance (academic competence and motivation); work adjustment (work competence and motivation 10 items); peer relationships (social network, gang involvement, friendship quality; 14 items); and leisure/recreation (quality of activity during leisure time; 12 items). Affirmative responses are summed to produce a score on each domain. The ABS domain scores can also be averaged to obtain an overall index. For the present investigation, ABS scores were obtained for time points 3, 4, and 5.

Youth-Decision Making Competence (Y-DMC). The Y-DMC battery is a collection of six component tasks designed to assess individual differences in rational responding (for details regarding the component scales and its correlates, see Parker et al., 2018; Parker & Fischhoff, 2005): (a) *Resistance to*

Framing measures whether choices are consistent across pairs of formally equivalent forms of items (Tversky & Kahneman, 1981; Fischhoff, 1983); (b) *Recognizing Social Norms* measures how well participants assess peer social norms; (c) *Under/Overconfidence* assesses the degree to which an individual's actual knowledge is calibrated to their level of confidence in their accuracy (Yates, 1990); (d) *Applying Decision Rules* presents participants with hypothetical purchase decisions, with products varying on different dimensions, and specified decision rules (Janis & Mann, 1977; Payne et al., 1993); (e) *Consistency in Risk Perception* assesses whether participants' risk judgments follow probability rules across a variety of formally related pairs, including proper subsets/supersets, conjunctions, disjunctions, and conditional probabilities; (f) *Resistance to Sunk Costs* measures the ability to ignore unrecoverable prior investments when making decisions (Arkes & Blumer, 1985), which should normatively be ignored, so that decisions reflect only possible future consequences. We calculated overall Y-DMC performance by deriving a regression-based factor score for an unrotated 1-factor solution for the six indicators. Higher scores indicate a greater tendency to respond rationally across tasks. The Y-DMC was assessed at Time 4.

Young Adult and Adult Self-Report (YASR/ASR; Achenbach, 1990; Achenbach & Rescorla, 2003). Age-appropriate ASEBA (https://aseba.org) instruments, including the YASR and ASR were administered in this sample at different time points. The YASR/ASR protocols are self-administered surveys derived from a widely-used standardized measure in developmental psychology, the Child Behavior Checklist (CBCL; Achenbach, 1999). These instruments were developed to measure emotional and behavioral problems in a standardized format in adolescents, young adults, and adults, respectively. At time point 4, 548 participants received the YASR and 27 received the ASR; at time point 5, 399 completed the YASR and 91 completed the ASR; at time point 6, 278 completed the YASR and 232 completed the ASR. The difference in the instrument used were due to the YASR being no longer issued by the publisher. For the purpose of the present investigation, we used the indices of internalizing (e.g., anxiety, depression, constraint) and externalizing (e.g., aggression, hyperactivity, noncompliance, and poor self-control) symptoms. Each of the 132 items measuring internalizing/externalizing symptoms are rated on a 3-point scale ranging from 0 = *Not true* to 2 = *Very true or often true*. In addition, the survey

includes an index of social competency (based on 20 items assessing participation in hobbies, games, sports, jobs, chores, friendship, and leisure activities), which was also used in the current analyses.

Antisocial Personality Disorder (ASPD) Interview. ASPD symptoms were assessed using an interview based on the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) Axis II Disorders (SCID-II; First et al., 1997). At time points 5 and 6, trained masters' level research associates conducted the SCID-II interviews; then, a diagnostic case conference with 2 psychiatrists or a psychiatrist and psychologist reviewed the diagnostic case files to make the diagnostic determination. The ASPD interviews produces a symptom count rating of the seven criteria for ASPD included in the DSM-IV (unaltered in the current version of the DSM, i.e., DSM-5).

Self-Reported Violence. A self-reported index of violence was also available at time point 5, based on the Andrew Scale of Severity and History of Offenses (Andrew, 1974). This scale originally consisted of 65 dichotomous (yes/no) items inquiring about engagement in different type of behavior that was punished by the law at the time when the scale was developed. As such, it includes items that are anachronistic, and even discriminatory nowadays (e.g., homosexuality). For the purpose of the present study, we used only an index that consisted of 21 items inquiring about self-reported violent behaviors (e.g., violent outbursts, fights, assaults, attempted murder).

Data Analytic Approach

Data analyses proceeded in three different steps involving both structural equation modeling (SEM) and classical test theory methods. First, we conducted CFAs on the MPQ-Tri item set to evaluate the replicability of the structural model reported by Brislin et al. (2015) in the current sample. To do so, we first conducted CFAs for each of the MPQ-Tri scales individually (i.e., MPQ-Boldness, MPQ-Meanness, and MPQ-Disinhibition) fitting a one-factor model to each item set. Next, we conducted a CFA on the whole MPQ-Tri item set fitting a three-correlated-factor model. In addition to comparing our model fit indices with those reported in the validation study of the MPQ-Tri scales, we also inspected our model fit indices in relation to common benchmarks, with Comparative Fit Index (CFI) values around .90 or larger and RMSEA values of .08 and smaller considered acceptable (van de Schoot et al., 2012). In

addition, in light of the noted potential limitations of CFA to modeling personality inventories in general and triarchic psychopathy measures in particular, we complemented CFA with ESEM analyses that allow all items to (cross-)load on all factors while specifying the desired number of factors, accounting for the conceptual overlap between factors as well as for the multidimensionality of the items' content.

Next, we tested the longitudinal measurement invariance of the MPQ-Tri items using SEM. To reduce computational strain and to avoid the risk of masking model misspecification, we conducted item-level longitudinal invariance analyses on the unidimensional MPQ-Boldness, MPQ-Meanness, and MPQ-Disinhibition scales separately. Specifically, we tested for configural and scalar invariance (van de Schoot et al., 2012). Testing for configural invariance, we examined whether the number of factors and the pattern of factor loadings are statistically equivalent across the different time points. Next, scalar invariance was tested by examining whether the factor loadings and item thresholds were statistically equivalent across the different time points. Concretely, to test for scalar invariance, we compared models with and without constraints in the equality of factor loadings across time point and in the equality of item thresholds across time point by means of χ^2-difference test. We did not test factor loading (i.e., metric invariance) and threshold (i.e., scalar) invariance separately because, with binary indicators, factor loadings and thresholds simultaneously influence the item characteristic curve (e.g., Muthen & Asparouhov, 2002; Muthén & Muthén, 2017). In instances of scalar non-invariance, modification indices were inspected to evaluate the possibility of partial scalar invariance by examining which loading or threshold equality constraint release could lead to the largest improvement in model fit. Subsequently, we would release one constraint at a time until partial invariance was achieved. Standard practices indicate that a latent construct should achieve at least partial invariance (Byrne et al., 1989). The final (partial) scalar invariance models were also used to examine the factor loadings for the items belonging to the MPQ-Tri scales, as well as to examine the rank-order stability estimate of each scale by examining the latent correlations between each consecutive time point, considering a correlation of .50 or higher to reflect acceptable levels of stability (Roberts & DelVecchio, 2000). To examine mean level stability, repeated measures analyses of variance (ANOVA) were tested for each MPQ-Tri scale with associated

$\eta^2_{partial}$ effect size, considering .01, .06, and .14 as indicative of small, medium, and large effect size, respectively (Cohen, 1988).

Finally, we examined the construct validity of the MPQ-Tri scales, by examining the within-time correlations between each MPQ-Tri scales and the criterion variables. In addition, we regressed each of the criterion variables on the MPQ-Tri scales entered simultaneously in multiple regression analyses in order to examine the unique contribution of each MPQ-Tri scales in their associations with each criterion. Construct validity analyses were conducted in SPSS 24 (IBM Corp., 2016), whereas all SEM analyses were conducted in Mplus 8 (Muthén & Muthén, 2017) using mean- and variance-adjusted weighted least squares (WLSMV) estimator. The DIFFTEST function was used to compare models in the longitudinal measurement invariance analyses. For construct validity findings, given the large number of associations and the large sample size, we considered significant associations at $p < .01$ and prioritized consideration of effect sizes over statistical significance.

Results

CFA and ESEM analyses of the MPQ-Tri Items, Internal Consistency, and Scale Inter-Correlations

Results of the CFAs are displayed in Table 2. According to the RMSEA values, the one-factor solutions for each of the MPQ-Tri scales was adequate, albeit relatively less so for MPQ-Tri-Disinhibition. The three-correlated factor model fit the data well at all time points. The RMSEA value for the baseline model was always below .158. In keeping with Brislin et al.'s (2015) scale development study, this finding suggests that incremental model fit indices are of little substantive value. Yet, we note that the CFI values indicated poor fit for all tested models. Table 3 shows descriptive statistics, internal consistency coefficients, and within-time latent correlations. Internal consistency coefficients were all $\geq$ .70 for all scales at each time point. Latent correlations among scales revealed that MPQ-Boldness was largely unrelated to MPQ-Meanness and Disinhibition. In contrast, latent correlations between MPQ-Meanness and Disinhibition were significant with large effect size at all time points.

A subsequent ESEM analyses showed that adopting an exploratory framework, the three correlated factor solution showed relatively better model fit indices, but CFI values nevertheless failed to

reach traditional standards. Inspection of the factor loadings (showed in Table 4 for the first time point and in Supplemental Table 1 for the subsequent time points) revealed, however, that the three factors did not clearly match with the a-priori item composition of the MPQ-Tri scales nor did they represent clearly theoretically meaningful constructs. In part, Factor 1 aligned with MPQ-Boldness and Factor 2 blended some of the elements (but not all) of MPQ-Meanness and MPQ-Disinhibition, also evidencing several instances of cross-loadings for items a-priori allocated to the MPQ-Meanness and Disinhibition scales.

More specifically, as evident from Table 4, it appeared that items tend to coalesce more in relation to their belonging to MPQ scales rather than to the triarchic psychopathy domains (e.g., social closeness items and stress reaction items each tended to load on the same factor). That is, ESEM analyses appeared to uncover the underlying structure of the MPQ (i.e., positive emotionality consisting of social potency, social closeness, and well-being; negative emotionality consisting of aggression, alienation, and stress reaction; and constraint consisting of harm avoidance and control) more so than the structure of the MPQ-Tri scales. Also the inter-correlations across factors revealed that the ESEM solution was not consistent with the triarchic psychopathy domains, and, in particular, with the conceptually expected overlap between meanness and disinhibition scales, given that (a) the correlation between factors never exceeded .238 across time-points and (b) higher correlation coefficients were reported for the association between Factor 1 and Factor 3, which would not be in line with the a-priori expectations were those factors representing MPQ-Boldness and either disinhibition or meanness. Based on these findings, and considering that an ESEM approach would not allow to examine partial measurement invariance, we continued adopting a CFA approach to test longitudinal measurement invariance as it allowed to examine our proposed measurement model (i.e., the MPQ-Tri scales as developed by Brislin et al. [2015]).

Longitudinal Measurement Invariance and Temporal Stability of the MPQ-Tri scales

A summary of results from the longitudinal invariance testing is reported in Table 4. The three MPQ-Tri scales also partial scalar invariance, after releasing 10, 2, and 1 item thresholds for MPQ-Boldness, Meanness, and Disinhibition, respectively (see Table 5 note). In particular, we used modification indices as well as inspection of the absolute difference between the configural and scalar

invariance models to identify thresholds that needed to be released to achieve a partial scalar invariance model that would not show significant decrement in model fit compared to the configural invariance model. To evaluate the magnitude and relevance of the differences in thresholds between the fully constrained scalar model and the final partial scalar invariance model, we calculated Cohen's *d* effect sizes of these differences. In total across the three MPQ-Tri scales, 13 thresholds were released (roughly, 5% of the total number of thresholds, i.e., 246). Based on Cohen's guidelines, the magnitude of these threshold differences did not appear meaningful, since all effect sizes were below the standard cut-off of .20 for small effect sizes. Hence, we deemed acceptable to release the equality constraints of these thresholds without violating measurement invariance in any practical or meaningful way, and the partial scalar invariance model was thus retained.

Factor loadings and between-time latent correlations for each MPQ-Tri scales are reported in Table 5. All factor loadings were statistically significant and associated with adequate (i.e. $\geq$ .245, with 49 out of 54 items having a factor loading > .300). Rank-order stability (i.e., between-time latent correlations) exceeded .50 for all MPQ-Tri scales at each time points both for consecutive time points, and for longer time intervals. Repeated measures ANOVAs revealed that MPQ-Boldness showed a non-significant decline over time, Wilk's $\lambda = .983$, $p = .126$, $\eta^2_{partial} = .017$. In contrast, MPQ-Meanness and Disinhibition showed a significant decrease over time, associated with a large effect size, respectively Wilk's $\lambda = .774$, $p < .001$, $\eta^2_{partial} = .226$, and Wilk's $\lambda = .731$, $p < .001$, $\eta^2_{partial} = .269$.

Construct Validity of the MPQ-Tri Scales

For the sake of space and clarity of exposition, the complete results of within-time correlation and regression analyses for the MPQ-Tri scales are displayed in Supplemental Tables 2-5 respectively. Table 6 summarizes these results showing the average correlation and regression coefficients for each of the criterion variables across the different time points (when available). Here, we summarize the main patterns of results organized by criterion measures. The average associations between self-regulation and the MPQ-Tri scales all denoted small associations due to variation across time points. Specifically, self-regulation was unrelated to the MPQ-Tri scales at time 3. Behavioral and cognitive dysregulation were

positively associated with MPQ-Meanness and Disinhibition at the following time points, and affective dysregulation was positively associated with MPQ-Meanness and Disinhibition at time points 5 and 6. Regression analyses showed that these associations remained significant only for MPQ-Disinhibition when controlling for the shared variance with the other MPQ-Tri scales. Finally, affective and cognitive dysregulation were negatively associated with MPQ-Boldness at time points 5 and 6.

Across time points, alcohol and marijuana use were positively associated with both MPQ-Meanness and Disinhibition. Although the pattern of unique associations (i.e., controlling for their shared variance) was not consistent over time, the main pattern seemed to favor associations with MPQ-Disinhibition more so than Meanness. Also MPQ-Boldness was positively associated with one of the indices of alcohol use (specifically, the dichotomous index) but only at time 4.

Across time points, MPQ-Meanness and Disinhibition were significantly and positively correlated with all indices of problem areas. Most of these associations remained significant also in regression analyses, although MPQ-Disinhibition appeared to be a relatively stronger and preferential correlate of these problem areas. In contrast, MPQ-Boldness was significantly and negatively associated with several problem areas across time points (i.e., behavioral problems, psychiatric disorders, social competence, school performance, leisure/recreation, health status, and family system), with more consistent associations emerged for psychiatric disorders, social competence, and leisure/recreation.

Regarding YASR/ASR scores, social competency was positively associated with MPQ-Boldness and negatively associated with MPQ-Meanness and Disinhibition across time points. A clear pattern of unique associations when controlling for the shared variance between MPQ-Meanness and Disinhibition did not emerge. Conversely, internalizing symptoms were negatively associated with MPQ-Boldness and positively with MPQ-Meanness and Disinhibition. Externalizing scores were unrelated to MPQ-Boldness and positively related to MPQ-Meanness and Disinhibition. When controlling for the shared variance among MPQ-Tri scales in multiple regression analyses, MPQ-Disinhibition showed a preferential relation with internalizing and externalizing symptoms. Finally, both MPQ-Meanness and Disinhibition had positive zero-order and unique associations with self-reported violence and ASPD symptom count at time

points 5 and 6, and these associations were relatively stronger for MPQ-Meanness. MPQ-Boldness was significantly and positively related to self-reported violence, but was unrelated to ASPD.

Discussion

The current study leveraged data from a large at-risk sample followed over a period of nine years to provide the first longitudinal examination of the triarchic psychopathy scales (i.e., Boldness, Meanness, and Disinhibition) based on the MPQ. Specifically, we examined (1) the factor structure (using both CFA and ESEM approaches), longitudinal measurement invariance, and temporal stability of the MPQ-Tri scales from age 16 to age 25; and (2) the construct validity of the MPQ-Tri scales in terms of within-time bivariate and unique associations with relevant correlates. Here, we discuss findings obtained for each of these aims.

Factor Structure, Longitudinal Measurement Invariance, and Temporal Stability of the MPQ-Tri Scales

Consistent with Brislin et al. (2015) original validation study conducted in adults, the three-correlated factors structure of MPQ-Tri scales exhibited adequate absolute model fit at all four time points, suggesting that the selected MPQ items can be used to measure the triarchic dimensions of Boldness, Meanness, and Disinhibition in late adolescence and young adulthood. In line with previous work (Brislin et al., 2015, 2017; Collison et al., 2020) and their conceptual overlap (Patrick et al., 2009), MPQ-Meanness and Disinhibition scales showed a large degree of overlap, sharing over 60% of the variance. Previous research on the TriPM (Somma et al., 2019) as well as our own ESEM analyses showed that some of the items measuring meanness and disinhibition tend to have substantial cross-loadings, likely due to content overlap between scales (e.g., with both meanness and disinhibition having elements of negative affectivity and antagonism; see also Hyatt et al., 2019; Miller et al., 2016). Additional sources of item covariation due to belonging to the same original MPQ scales or to similar item wording or content may have unduly inflated the latent correlations between the MPQ-Meanness and Disinhibition scales when constrained by a purely confirmatory approach. Further, the high-risk nature of the sample may also be one reason for a latent correlation that partly exceeded theoretical expectations.

Indices of incremental model fit fell below commonly accepted standards. In line with the issues noted above regarding potential sources of item covariations that were not accounted for by a simple three-correlated factor structure, it is also possible that this is due to the fact that each of the three triarchic scales are psychometrically multidimensional (Collison et al., 2020; Roy et al., 2020; Shou et al., 2018). More broadly, this possibility is consistent with other research on the structure of psychopathological dimensions that has identified that different lower-order dimensions characterize the broader construct of disinhibition (i.e., disagreeable and unconscientious disinhibition; Markon et al., 2005). Indeed, the triarchic domains were conceptually designed to measure broad target dimensions (Patrick & Drislane, 2015; Somma et al., 2019). This is also evident in the fact that items for each of the three MPQ-Tri scales belong to different scales contained in the original MPQ (see Table 5), and that these tended to coalesce onto the same factors when modeled in an exploratory framework in our supplemental ESEM analyses.

Problems in adopting a strict confirmatory approach for modeling item-level data from complex personality questionnaires are well-documented (e.g., Hopwood & Donnellan, 2010). In part, our ESEM analyses helped clarify the CFA results, since constraining item cross-loadings as well as constraining items derived from the same MPQ original scale to load on separate factors may have led to poor model fit indices in CFA. More broadly, in conjunction with CFA results, our ESEM analyses also emphasized the potential perils of applying traditional factor analytic approaches to model complex personality inventories where all potential sources of item covariations cannot be easily specified a-priori (Sellbom & Tellegen, 2019; Somma et al., 2019). Perhaps this issue was amplified in the case of the MPQ-Tri scales, as they were based on a sub-set of items drawn from a larger inventory designed to measure different multi-dimensional factors each containing lower-order facets.

In light of these considerations, we did not deem the factor analytic results sufficient to suggest the need to propose alternative MPQ-Tri scales, and thus, we retained the original scope of the study to investigate the MPQ-Tri scales as originally developed. Indeed, we believe that accumulating knowledge across different datasets on the scales developed by Brislin et al. (2015) is necessary to gauge the performance of these scales more comprehensively, whereas it would likely create more confusion to

propose an alternative measure of the same constructs based on the same item pool. Further, it may be unwarranted to advocate for refuting the item selection proposed by Brislin et al. (2015) based on a single study, as that may result in sample-specific and non-replicable suggestions of a different item set when based exclusively on factor analytic findings, especially in absence of compelling theoretical alternatives (Brislin et al., 2015). However, the fact that the triarchic psychopathy scales modeled using the MPQ or other inventories exhibit in most cases poor indices of model fit may represent a reason for concern from a measurement perspective (see Collison et al., 2020, for a comprehensive investigation of this matter).

The suboptimal structural properties of the MPQ-Tri scales need to be placed in the context of a broader examination of their psychometric performance, including evidence of measurement invariance and construct validity within the broader nomological network of psychopathy (Somma et al., 2019). Specifically, adopting a CFA approach was useful to report evidence of partial measurement invariance for the MPQ-Tri scales across the four time points spanning from age 16 to age 25. Thus, we built on the foundation laid by Brislin et al. (2015, 2017), showing that the MPQ-Tri scales can effectively be used in developmental research on psychopathy according to a triarchic perspective. Although we recognize that model re-specification was necessary to achieve partial scalar invariance, in particular concerning the MPQ-Boldness scale, the modifications needed likely reflected the high sensitivity of Chi-square difference testing in relatively large samples, did not appear to be of any practical or meaningful significance, and rather represented an often necessary practice that will certainly benefit from further replications in independent samples (Chen, 2007; see Sellbom & Tellegen, 2019 for further considerations on model re-specification). Only one item (item 274, “Before I get into a new situation I like to find out what to expect from it”, Boldness scale) was associated with a very low factor loading and threshold non-invariance at time 5 and 6. In addition, item 94 (“I am quite effective at talking people into things”, Boldness scale) was associated with threshold non-invariance across all time points. If replicated in different samples, these items may be considered for removal.

Relatedly, we found evidence of relative stability for the MPQ-Tri scales over time. All three scales had large rank-order stability coefficients over time, and, consistent with previous research using

other measures of psychopathy (Blonigen et al., 2006), MPQ-Boldness (akin to the Fearless Dominance scale in Blonigen et al.'s [2006] study) showed higher mean-level stability than MPQ-Meanness and Disinhibition. From a developmental psychopathology perspective, this is in line with well-replicated findings that in the transition from late adolescence to young adulthood, personality traits characterized by more destructive forms of externalizing behaviors (here, meanness and disinhibition) tend to show a substantial decline on average (Tremblay, 2000). This may suggest that higher levels of these traits alone at younger ages are not necessarily indicative of poor outcomes later in time, though findings of high rank-order stability do suggest that those with higher levels of these traits would still have higher levels compared to their peers. Understanding how these traits develop over time, and the degree to which such a trajectory is heterogenous, is a goal for future research.

Construct Validity of the MPQ-Tri Scales

Construct validity evidence for the MPQ-Tri scales is especially important given the nuanced conceptual elaboration of the distinct nomological networks surrounding Boldness, Meanness, and Disinhibition (Patrick et al., 2009; Patrick & Drislane, 2015) and the empirical evidence accumulating that supports their distinct nomological networks (Nelson et al., 2016; Patrick, Venables, Yancey, et al., 2013; Sellbom & Phillips, 2013). Despite some notable exceptions, the present study provided convincing support for the construct validity of the MPQ-Tri scales. In particular, we found good evidence in support of the construct validity of the MPQ-Boldness scale. Further, we found good evidence for the construct validity of the MPQ-Meanness and Disinhibition scale, although evidence for their discriminant validity was mixed. Overall, our findings seemed to show a clearer and stronger pattern of associations between psychopathic traits and the selected criterion variables at older age, especially concerning the maladaptive correlates of meanness and disinhibition, which is consistent with the developmental psychopathology perspective mentioned above (i.e., that they may be more maladaptive in adulthood than in late adolescence where a peak of externalizing traits is, at least partly, normative; Tremblay, 2000).

More concretely, we found support for the expected divergent associations between MPQ-Boldness versus MPQ-Meanness and Disinhibition with indices of positive versus negative adjustment

across domains. As expected, MPQ-Boldness was associated with better self-regulation (although associations between MPQ-Tri scales and self-regulation were stronger and more consistent in young adulthood than in late adolescence). Further, Boldness was consistently associated across time with lower levels of psychiatric disorders, better social competence, better decision-making competence, and better adjustment in terms of leisure/recreation. Boldness was also associated with lower levels of internalizing symptoms and was largely unrelated to externalizing symptoms. Interestingly, in line with previous research (Patrick, Venables, & Drislane, 2013; Wall et al., 2014), MPQ-Boldness was positively associated with self-reported violence, but was unrelated to ASPD symptoms, consistent with the description of boldness as key factor in differentiating psychopathy with the DSM-based diagnostic category of ASPD. Overall, whereas MPQ-Boldness had largely adaptive correlates, its association with violent behavior is consistent with its characterization as a construct that has both adaptive and maladaptive correlates (Coffey et al., 2018; Patrick et al., 2009; Patrick & Drislane, 2015; Sellbom & Phillips, 2013), a pattern consistent across time point and across correlation and regression analyses.

The MPQ-Meanness and Disinhibition scales showed a pattern of bivariate correlations that were largely consistent with conceptual expectations. Both scales were positively associated with poorer self-regulation (again, from age 19 onward), alcohol and marijuana use, environmental risk factors, and problems across all life domains. Furthermore, both scales were positively associated with both internalizing and externalizing symptoms, as well as with both ASPD symptoms and self-reported violence. Inspection of results about their correlates when controlling for shared variance among MPQ-Tri scale showed discriminant validity evidence for Meanness and Disinhibition that was partly consistent with the expectations and in line with previous findings (Bass & Nussbaum, 2010; Brislin et al., 2015, 2017; Sellbom & Phillips, 2013; Vassileva et al., 2007; see Weller et al., 2018 for similar results with HEXACO personality dimensions). Specifically, self-regulation, psychosocial adjustment, internalizing and externalizing symptoms, as well as decision-making competence were preferentially linked to MPQ-Disinhibition compared to MPQ-Meanness. In contrast, violent behavior and ASPD symptoms were

preferentially related to MPQ-Meanness. It should be noted, however, that this pattern was not always clear at all time points and for all correlates (e.g., environmental risk and substance use).

Limitations

The present findings should be considered in light of the study limitations. One limitation of the present study was implied in the use of data collected for other purposes, which did not allow us to a-priori select for inclusion the best measures for evaluating the construct validity of the MPQ-Tri scales. For instance, we did not have data available to distinguish reactive and proactive forms of violent behavior, which could have provided a more nuanced test of the discriminant validity of the MPQ-Meanness and Disinhibition scales. Yet, we believe that the advantage of using this existing dataset outclasses this limitation, as it allowed us to conduct a large-scale investigation with an at-risk sample followed across a long time span, while still including relevant measures for construct validation. Another limitation was that, except for the SCID-II, the measures used in the present study were based on self-reported data, with associated risks of mono-method bias. Finally, although the present study over-sampled at-risk participants based on parental substance use history, given the relevance of psychopathy for forensic psychology, it would be important for future studies to include samples of incarcerated individuals or to over-sample participants who came into contact with the criminal justice system. Yet, there are clear difficulties in following up participants from adolescence into adulthood due to the separation of juvenile and adult criminal justice in most countries.

Conclusions

Despite its limitation, the present study provides a rigorous test of the MPQ-Tri scales. Following traditional (Cronbach & Meehl, 1955; Messick, 1981) and recent (Sellbom & Tellegen, 2019) recommendations in psychological assessment research and construct validity testing, a multitude of evidence should be considered when evaluating whether the MPQ-Tri scales fulfill their intended purpose to a satisfactory extent. Both CFA and ESEM analyses suggested that each of the MPQ-Tri scales may contain additional sources of item covariations that impact model fit indices. In our study, these appeared to be due to item characteristics more so than to conceptually meaningful patterns underlying the three

broad factors included in the triarchic model (especially when derived from parent inventories designed to assess different target constructs), but investigation of this matter in independent samples is imperative to further gauge the psychometric properties of the MPQ-Tri scales. Our factor analytic results may be consistent with arguments that standard measurement framework and emphasis on model fit indices penalize the evaluation of complex personality inventories (Patrick et al., 2020; Sellbom & Tellegen, 2019). However, it is important to acknowledge that a contrasting argument is that model fit indices should not be too easily discarded and the possibility that the triarchic psychopathy constructs are better modeled as multidimensional should receive greater attention (e.g., Roy et al., 2020, 2021). At the same time, these approaches have relevance for measurement invariance testing purposes, as reported in the present investigation. In particular, we provided evidence for the partial longitudinal measurement invariance of the MPQ-Tri scales between age 16 and 25. Also in this context, however, it is worth emphasizing that half of the Boldness items exhibited evidence of non-invariance. Taken together with the relatively low factor loadings of some of the items (and in particular of some of the Boldness items), further scrutiny of the original item selection appears warranted in future studies. Next, we replicated and extended previous evidence on the construct validity of the MPQ-Tri scales, which related to external correlates in a manner largely consistent with their nomological network. This was evident for the MPQ-Boldness scale, as it mostly correlated with indices of positive adjustment and violence, but not ASPD. Also the construct validity of the MPQ-Meanness and Disinhibition scales received adequate support, although evidence for their discriminant validity was not as clear as theoretically expected, at least with regard to the correlates available within the present dataset. This suggests that their use in multiple regression analyses should always be preceded and accompanied by inspection of their bivariate correlations with external correlates. On balance, extending Brislin et al.'s (2015, 2017) seminal work, our findings provide incremental evidence that the MPQ-Tri scales can be used in large-scale epidemiological studies on the causes and consequences of psychopathy, being mindful of their potential caveats. The use of these scales may bear important implications for theory refinement, clinical work, and policy making centered around the reduction of antisociality.

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Table 1

Overview of criterion measures and hypothesized associations with MPQ-Triarchic scales.

Construct	Measure(s)	Time point(s)	Hypotheses		
			B	M	D
Self-regulation	Dysregulation Inventory (Mezzich et al., 2001)	3,4,5,6	-	0	+
Alcohol and marijuana use	Ad-hoc single item + items from the DUSI (Tarter, 1990)	3,4,5	0	0	+
Psychosocial maladjustment	Absolute Problem Density Profile (based on DUSI items; Tarter, 1990)	3,4,5	-	0	+
Decision making competence	Youth Decision Making Competence (Parker & Fischhoff, 2005)	4	0	0	-
Social Competency	Young Adult Self-Report (Achenbach, 1990)	4,5,6	+	-	-
Internalizing symptoms	Young Adult Self-Report (Achenbach, 1990)	4,5,6	-	0	+
Externalizing symptoms	Young Adult Self-Report (Achenbach, 1990)	4,5,6	0	+	+
Antisocial Personality Disorder	SCID-II (First et al., 1997)	5,6	0	+	+
Violent behavior	Andrew Scale of Severity and History of Offenses (Andrew, 1974)	5	0	+	+

Note. DUSI = Drug Use Screening Inventory. CEDAR = Center for Education and Drug Abuse Research. SCID-II = Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) Axis II Disorders. B = Boldness. M = Meanness. D = Disinhibition. Sources of hypotheses: Brislin et al. (2015, 2017), Patrick et al. (2009), Patrick & Drislane (2015). Hypotheses refer to preferential associations with the external correlates (i.e., relatively stronger associations and/or associations that remain significant in multiple regression analyses that control for the shared variance among triarchic psychopathy scales.

Table 2

Confirmatory factor analysis (CFA) results. One-factor models for Boldness, Meanness, and Disinhibition separately and three correlated factor model of the MPQ-based triarchic psychopathy scales across time. For comparison, exploratory structural equation modeling (ESEM) results are displayed for the three correlated factor models (total N = 716).

Scale	Time point	*n*	χ^2	*df*	*RMSEA* baseline	*RMSEA*	*RMSEA* 90% CI	*CFI*
Boldness	3	623	679.091	170	.124	.069	.064 – .075	.721
Boldness	4	569	802.605	170	.140	.081	.075 – .087	.702
Boldness	5	483	685.990	170	.152	.079	.073 – .086	.758
Boldness	6	504	768.132	170	.163	.084	.078 – .090	.766
Meanness	3	623	452.790	104	.181	.073	.067 – .080	.857
Meanness	4	569	403.817	104	.176	.071	.064 – .079	.859
Meanness	5	483	404.128	104	.176	.077	.069 – .085	.833
Meanness	6	504	425.901	104	.178	.078	.071 – .086	.833
Disinhibition	3	623	913.803	135	.160	.096	.090 – .102	.680
Disinhibition	4	569	808.563	135	.163	.094	.087 – .100	.708
Disinhibition	5	483	638.779	135	.177	.088	.081 – .095	.783
Disinhibition	6	504	844.303	135	.195	.102	.096 – .109	.757
CFA 3CF	3	623	3659.814	1374	.089	.052	.050 – .054	.673
CFA 3CF	4	569	3745.489	1374	.091	.055	.053 – .057	.645
CFA 3CF	5	483	3355.279	1374	.093	.055	.052 – .057	.669
CFA 3CF	6	504	3730.646	1374	.099	.058	.056 – .061	.669
ESEM 3CF	3	623	2311.17	1272	.089	.036	.034 – .039	.851
ESEM 3CF	4	569	2405.822	1272	.091	.040	.037 – .042	.830
ESEM 3CF	5	483	2081.958	1272	.093	.036	.033 – .039	.865
ESEM 3CF	6	504	2237.206	1272	.099	.039	.036 – .0410	.864

Note. B = Boldness. M = Meanness. D = Disinhibition. 3F = 3 correlated factors. df = degrees of freedom. RMSEA = root mean square error of approximation. CFI = comparative fit index. All Chi-square tests were statistically significant. All fit indices based on the robust standard errors and WLSMV estimator.

Table 3

Mean, standard deviation (SD), internal consistency α values, and within-time latent correlations (based on the CFA three correlated factor models) of the MPQ-triarchic scales (N = 716).

	Time 3			Time 4			Time 5			Time 6		
	B	M	D	B	M	D	B	M	D	B	M	D
Boldness (B)	**.70**			**.72**			**.72**			**.75**		
Meanness (M)	.02	**.72**		.03	**.73**		.01	**.72**		.14	**.71**	
Disinhibition (D)	-.03	.81***	**.76**	.01	.83***	**.76**	-.04	.83***	**.79**	.14	.81***	**.80**
M	1.60	1.37	1.40	1.59	1.31	1.34	1.59	1.29	1.30	1.57	1.27	1.29
SD	.18	.20	.21	.19	.19	.20	.18	.19	.21	.19	.18	.21

Note. B = Boldness. M = Meanness. D = Disinhibition. Bolded coefficients on the diagonals are internal consistency *α* values.
*** $p < .001$.

Table 4

Longitudinal invariance tests based on the CFA Boldness, Meanness, and Disinhibition one-factor models: model fit indices and difference tests (N = 716).

Scale	Model	Chi-square test of model fit			*RMSEA*	*CFI*	Chi-square for difference testing			
		χ^2	*df*	*p*				χ^2	*df*	*p*
Boldness	A. Configural invariance	5081.285	2954	< .001	.032	.794				
Boldness	B. Scalar invariance	5074.196	3068	< .001	.030	.806	B vs. A	153.143	114	.009
Boldness	C. Partial scalar invariance	5049.228	3062	< .001	.030	.808	C vs. B	133.254	108	.050
Meanness	A. Configural invariance	2905.820	1850	< .001	.028	.896				
Meanness	B. Scalar invariance	2925.349	1940	< .001	.027	.903	B vs. A	128.611	90	.005
Meanness	C. Partial scalar invariance	2896.637	1938	<.001	.026	.905	C vs. A	108.933	88	.065
Disinhibition	A. Configural invariance	4590.323	2370	< .001	.036	.801				
Disinhibition	C. Scalar invariance	4502.431	2472	< .001	.034	.818	B vs. A	133.773	102	.019
Disinhibition	D. Partial scalar invariance	4487.896	2471	< .001	.034	.819	C vs. A	123.245	101	.066

Note. df = degrees of freedom. RMSEA = root mean square error of approximation. CFI = comparative fit index. All fit indices based on robust standard errors and WLSMV estimator.

Table 5

Standardized factor loading of the CFA and ESEM analyses (most right columns) and between-time latent correlations (most left column; based on CFA results) for each of the MPQ-based triarchic scales (N = 716).

				CFA	ESEM		
					F1	F2	F3
Boldness	Item #	Domain	Primary scale	λ	λ	λ	λ
$r_{T3\text{-}T4}$ = .66	94[abcd]	Social potency	Persuasive	**.764**	**.656**	.018	.087
$r_{T3\text{-}T5}$ = .60	25[cd]	Social potency	Enjoy visibility/dominance	**.627**	**.673**	-.015	.003
$r_{T3\text{-}T6}$ = .58	163	Social potency	Likes being in charge	**.392**	**.529**	.070	-.058
$r_{T4\text{-}T5}$ = .73	1	Social potency	Likes being in charge	**.583**	**.426**	-.025	.056
$r_{T4\text{-}T6}$ = .69	47	Social potency	Enjoy visibility/dominance	**.543**	**.438**	**-.195**	.117
$r_{T5\text{-}T6}$ = .83	105	Social potency	Persuasive	**.767**	**.652**	-.014	.132
	35[d]	Social potency	Enjoy visibility/dominance	**.518**	**.541**	.000	-.004
	218	Social potency	Enjoy visibility/dominance	**.376**	**.351**	**-.206**	**.155**
	257	Social potency	Persuasive	**.455**	**.341**	.002	**.087**
	77	Harm avoidance	Dislikes adventures	**.307**	.078	-.110	**.374**
	33	Harm avoidance	Dislikes disaster areas	**.245**	-.103	.086	**.405**
	149	Harm avoidance	Dislikes adventures	**.303**	.081	-.024	**.215**
	48	Stress reaction	Nervous	**.285**	.082	**-.438**	**.162**
	222	Stress reaction	Sensitive	**.350**	**.263**	**-.301**	**.148**
	15	Stress reaction	Sensitive	**.293**	**.148**	**-.386**	**.264**
	209[d]	Well-being	Interesting experiences	**.444**	**.493**	**-.142**	-.029
	256	Well-being	Interesting experiences	**.394**	**.508**	**-.164**	.076
	124	Achievement	Likes challenges	**.491**	**.423**	**-.190**	**.141**
	274[cd]	Control	Tries anticipate events	**.084**	**-.322**	**-.163**	**.604**
	28	Unlikely virtues	Unlikely virtues	**.375**	**.456**	-.026	.011
Meanness	Item #	Domain	Primary scale	λ	λ	λ	λ
$r_{T3\text{-}T4}$ = .71	97	Aggression	Enjoys distressing others	**.677**	-.023	**.476**	**.470**
$r_{T3\text{-}T5}$ = .69	66	Aggression	Victimizes for own gain	**.518**	.100	**.290**	**.375**
$r_{T3\text{-}T6}$ = .70	172	Aggression	Enjoys observing violence	**.749**	.119	**.393**	**.553**
$r_{T4\text{-}T5}$ = .78	202[a]	Aggression	Physical violence	**.659**	.108	**.436**	**.349**
$r_{T4\text{-}T6}$ = .71	127	Aggression	Vengeful	**.597**	-.093	**.231**	**.516**
$r_{T5\text{-}T6}$ = .79	112	Aggression	Enjoys distressing others	**.493**	**.206**	**.382**	**.310**
	232	Aggression	Enjoys observing violence	**.739**	.043	**.329**	**.568**
	261	Aggression	Vengeful	**.706**	**.188**	**.566**	**.447**
	293[a]	Aggression	Physical violence	**.643**	-.040	**.500**	**.395**
	158	Aggression	Enjoys distressing others	**.577**	-.016	**.440**	**.398**
	31	Social closeness	Welcomes support	**.286**	**-.211**	**-.284**	.028
	60	Social closeness	Warm/affectionate	**.396**	**-.406**	**.257**	**.265**
	152	Social closeness	Values close relations	**.305**	**-.342**	**.237**	**.181**
	45	Social closeness	Welcomes support	**.415**	**-.263**	**.373**	.029
	221	Social closeness	Warm/affectionate	**.392**	**-.325**	**.366**	.002

	283	Alienation	Feels exploited	**.476**	**-.133**	**.67**	-.028
Disinhibition	Item #	Domain	Primary scale	λ	λ	λ	λ
$r_{T3\text{-}T4}$ = .65	104	Control	Cautious careful	**.479**	-.013	**.189**	**.490**
$r_{T3\text{-}T5}$ = .57	64	Control	Plans ahead	**.377**	**-.148**	-.017	**.489**
$r_{T3\text{-}T6}$ = .58	26	Control	Tries anticipate events	**.521**	**-.493**	-.046	**.653**
$r_{T4\text{-}T5}$ = .74	90	Control	Sensible, structured	**.360**	**-.246**	.061	**.518**
$r_{T4\text{-}T6}$ = .70	115	Control	Cautious careful	**.425**	-.063	.083	**.558**
$r_{T5\text{-}T6}$ = .77	151	Control	Reflective	**.495**	**.183**	**.126**	**.423**
	41	Control	Reflective	**.734**	**-.170**	**.334**	**.512**
	162	Control	Sensible, structured	**.543**	**-.415**	-.005	**.794**
	147	Alienation	Sees self as target	**.568**	-.050	**.672**	-.058
	238	Alienation	Feels betrayed	**.561**	-.010	**.742**	**-.259**
	298	Alienation	Believes others wish him to fail	**.526**	.060	**.592**	.025
	178	Alienation	Sees self as target	**.525**	**.134**	**.647**	-.106
	95	Stress reaction	Mood swings	**.517**	-.069	**.535**	-.129
	131	Stress reaction	Mood swings	**.557**	-.038	**.525**	-.004
	212	Stress reaction	Easily upset	**.436**	.089	**.468**	.054
	270	Stress reaction	Nervous	**.632**	.031	**.574**	.083
	82[a]	Aggression	Physical violence	**.533**	.006	**.559**	**.370**
	22	Aggression	Vengeful	**.412**	.074	**.477**	**.527**

Note. CFA = Confirmatory Factor Analysis. ESEM = Exploratory Structural Equation Modeling. For the CFA, factor loadings refer to the one-factor scalar invariance models. For the ESEM, factor loadings are reported for Time 3 for reference, based on the three-correlated factor model. Factor loadings at the other time points are reported in the online supplemental materials in the interest of space. Item #, scale, and subscale refer to the 300-item version of the Multidimensional Personality Questionnaire (MPQ). Statistically significant factor loadings are reported in bold typeface. Items flagged with a superscript ([a, b, c, d]) indicate threshold non-invariance at time 3, 4, 5, and/or 6, respectively.

Table 6

Summary of construct validity analyses for the MPQ-based triarchic psychopathy scales: average correlation and regression coefficients across time points.

		Average correlation coefficients			Average standardized regression coefficients[a]			
Construct	**Time point(s)**	**Boldness**	**Meanness**	**Disinhibition**	**Boldness**	**Meanness**	**Disinhibition**	R^2/R^2_N
DI affective	3 – 6	-.101	.092	.130	-.108	.041	.144	.055
DI behavioral	3 – 6	-.008	.110	.155	-.010	.024	.140	.044
DI cognitive	3 – 6	-.087	.160	.203	-.096	.062	.169	.079
DUSI alcohol	3 – 5	-.010	.128	.146	-.011	.059	.111	.029
DUSI marijuana	3 – 5	-.009	.151	.177	-.013	.072	.133	.036
ABS substance use	3 – 5	.024	.318	.334	.016	.181	.224	.135
ABS behavioral problems	3 – 5	-.087	.456	.544	-.100	.207	.418	.332
ABS health status	3 – 5	-.080	.175	.294	-.082	-.005	.298	.103
ABS psychiatric disorder	3 – 5	-.153	.337	.502	-.159	.057	.470	.280
ABS social competence	3 – 5	-.216	.247	.362	-.220	.052	.333	.184
ABS family system	3 – 5	-.074	.323	.415	-.081	.115	.346	.188
ABS school performance	3 – 5	-.056	.392	.452	-.066	.189	.339	.235
ABS work adjustment	3 – 5	-.012	.414	.404	-.023	.262	.246	.217
ABS peer relationships	3 – 5	.025	.430	.449	.013	.247	.299	.243
ABS leisure/recreation	3 – 5	-.152	.366	.416	-.163	.188	.304	.224
ABS total score	3 – 5	-.107	.488	.592	-.119	.207	.468	.391
Y-DMC Total	4	.200	-.187	-.215	.206	-.089	-.170	.094
YASR Social competency [b]	4 – 6	.145	-.207	-.223	.156	-.125	-.149	.089
YASR Internalizing [b]	4 – 6	-.125	.195	.218	-.138	.108	.155	.075
YASR Externalizing [b]	4 – 6	.008	.227	.306	-.002	.061	.267	.102
ASPD symptom count	5 – 6	.013	.453	.428	-.017	.303	.239	.242
Self-reported violence	5 – 6	.161	.417	.371	.134	.292	.181	.214
Alcohol use (Y/N)	3 – 5	.069	.199	.195	.820	1.686	1.551	.085
					OR 3.003	5.653	5.283	
Marijuana use (Y/N)	3 – 5	-.010	.257	.244	-.251	1.930	1.484	.111
					OR .833	8.068	5.863	

Note. DI = Dysregulation Inventory. DUSI = Drug Use Screening Inventory (number of uses in the past year). ABS = Absolute Problem Density Profile. Y-DMC = Youth Decision Making Competence Measure. YASR = Young Adult Self-Report. ASPD = Antisocial Personality Disorder. *M(SD)* = Means and standard deviations for the criterion variables in all available cases. *n* = valid cases for the analyses involving the MPQ-triarchic scales. OR = Odd Ratio.

[a] *B* coefficients based on logistic regression analyses are reported for Alcohol and Marijuana use (Y/N), with corresponding Nagelkerke's R^2 (R^2_N). The full correlation matrices across all time points are reported in the online Supplemental Materials.