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CONSTRUCT VALIDITY OF TRIARCHIC MODEL TRAITS IN THE DUNEDIN MULTIDISCIPLINARY HEALTH AND DEVELOPMENT STUDY USING THE MULTIDIMENSIONAL PERSONALITY QUESTIONNAIRE

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The triarchic model of psychopathy emphasizes the role of three phenotypic personality domains (boldness, meanness, and disinhibition) that have been operationalized using the well-established Multidimensional Personality Questionnaire. The present study sought to further validate the MPQ-Tri scales and examine their temporal stability and predictive validity across two time points (ages 18 and 26) from the Dunedin Multidisciplinary Health and Development Study, a population-representative and longitudinal sample (N = 1,037). This investigation necessitated modification of the MPQ-Tri scales to enable their use in a broader range of samples, including the Dunedin Study. The revised MPQ-Tri scales demonstrated good temporal stability, and correlation and multiple linear regression analyses predominantly revealed associations consistent with theoretical expectations. Overall, the findings provide support for the MPQ-Tri scales as reliable, stable, and valid measures of the triarchic constructs, which provide a unique opportunity to examine highly novel research questions concerning psychopathy in a wide variety of samples.

Keywords: personality assessment, psychopathy, triarchic psychopathy model, Multidimensional Personality Questionnaire, construct validity

Supplementary materials are available online.

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Psychopathy is a pathological personality condition encompassing a distinct constellation of affective, interpersonal, and behavioral features (Hare, 2003; Lykken, 2006). A range of different theoretical perspectives and assessment procedures for understanding and assessing this condition have been the subject of considerable debate over many years (Patrick, 2022). Patrick et al. (2009) advanced the triarchic model of psychopathy as a framework for reconciling alternative theories and measurement methods and for characterizing how they converge and diverge from one another. These authors identified three descriptive (phenotypic) elements that recur consistently throughout the literature on psychopathy—which they termed *boldness*, *meanness*, and *disinhibition*—and conceptualized them in trait-dispositional terms. Boldness entails being self-assured and having the ability to manipulate social situations, a lack of stress-reactivity, and the capacity to cope with unfamiliar or dangerous situations (Gatner et al., 2018; Lilienfeld et al., 2016; Patrick & Drislane, 2015; Patrick et al., 2009; Sellbom, 2019). Meanness encompasses callousness, an absence of empathy and remorse, the inability to form close personal attachments, and a tendency to manipulate, deceive, exploit, or act cruelly toward others, as well as a gaining sense of enjoyment or empowerment from doing so (Patrick & Drislane, 2015; Patrick et al., 2009; Sellbom, 2019). Finally, disinhibition reflects proneness to immediate gratification seeking and a lack of impulse control involving diminished behavioral restraint and deficient affect regulation (Patrick & Drislane, 2015; Patrick et al., 2009; Sellbom, 2019).

A number of different self-report measures have been developed to operationalize the trait constructs of the triarchic model. The most widely used measure to date has been the Triarchic Psychopathy Measure (TriPM; Patrick, 2010), a 58-item inventory that contains subscales assessing boldness, meanness, and disinhibition. The TriPM and its subscales demonstrate robust relations with well-established psychopathy measures, including the Psychopathy Checklist-Revised (PCL-R; Hare, 2003), the original and revised Psychopathic Personality Inventory (PPI/PPI-R; Lilienfeld & Andrews, 1996; Lilienfeld & Widows, 2005), and the Levenson Self-Report Psychopathy Scale (LSRP; Drislane, Patrick, & Arsal, 2014; Drislane, Patrick, Sourander, et al., 2014; Levenson et al., 1995; Sellbom & Phillips, 2013; see Sellbom, 2019, for a review). The TriPM also shows robust associations with conceptually relevant criterion measures of personality, personality pathology, and delinquent behaviors (e.g., Sellbom, 2019). For example, Boldness shows positive associations with the Interpersonal facet of the PCL-R and measures of grandiose narcissism and extraversion, and relates negatively to measures of fear, anxiety, and neuroticism (Patrick, 2010; Poy et al., 2014; Stanley et al., 2013; Venables et al., 2014; Wall et al., 2015). In contrast, Meanness relates positively to the PCL-R's Affective facet, grandiose narcissism, and various forms of aggressive and delinquent behavior, but negatively to agreeableness, openness, and to a lesser degree conscientiousness (Donnellan & Burt, 2016; Patrick, 2010; Stanley et al., 2013; Venables et al., 2014; Wall et al., 2015). Finally, Disinhibition shows positive associations with the PCL-R's Lifestyle facet, neuroticism, and various forms of aggression and delinquent behavior, but relates negatively to conscientiousness (Donnellan & Burt, 2016; Patrick, 2010; Stanley et al., 2013; Venables et al., 2014; Wall et al., 2015). Based on

these associations with conceptually relevant criterion measures, it appears that the TriPM assesses psychopathy in a manner consistent with its theoretical perspective.

Despite the evidence supporting its construct validity, the TriPM represents only one approach to operationalizing the triarchic model constructs, which are considered open constructs (e.g., Meehl, 1986) to be further understood and refined through research using different measurement methods (Patrick & Drislane, 2015). Considerable evidence indicates that closely associated psychopathy measures and personality inventories with sufficient item content can also be used to operationalize the triarchic model (Patrick & Drislane, 2015; Sellbom, 2019). To date, various alternative operationalizations have been developed. The process of scale development has typically employed a methodology in which consensus ratings of construct relevance are first used to identify candidate items for each scale. Following this, the candidate item sets are refined through an iterative process in which an item's contribution to internal consistency of the target scale and divergence from items of nontarget scales is considered, resulting in addition of better performing items and deletion of poorly performing ones. This procedure has been used to develop scale measures of the triarchic model constructs from items of both psychopathy-specific measures, such as the PPI/PPI-R and the Youth Psychopathic Traits Inventory (YPI; Andershed et al., 2002; see Drislane, Brislin, et al., 2014), and broadband measures of personality and psychopathology, including the Minnesota Multiphasic Personality Inventory–2–Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008; see Sellbom et al., 2016), the Personality Inventory for the *DSM-5* (PID-5; Krueger et al., 2012; see Drislane et al., 2019), and the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982; Tellegen & Waller, 2008; see Brislin et al., 2015). The last-mentioned of these operationalizations, employing items of the MPQ, is the focus of the current investigation.

MPQ OPERATIONALIZATION OF THE TRIARCHIC MODEL CONSTRUCTS

The MPQ has been widely administered in correctional and community settings to study personality[1] (see Patrick & Kramer, 2017, for a review) and has been included in longitudinal studies such as the Minnesota Twin Family Study (Iacono et al., 1999) and the Dunedin Multidisciplinary Health and Development Study (Krueger et al., 1996). It is a true/false response self-report inventory that measures individual differences in personality traits. The full-length form was originally 300 items but was later reduced to 276 (Tellegen & Waller, 2008), and a formal 155-item brief form (MPQ-BF; Patrick et al., 2002) as well as an MPQ Form NZ (see Krueger et al., 1996) have also been developed. Brislin et al. (2015) created MPQ-based triarchic scales (MPQ-Tri scales) from the MPQ-BF through the aforementioned process of consensus ratings and

1. The two most common formal citations for the MPQ (Tellegen, 1982; Tellegen & Waller, 2008) total almost 3,000 citations in Google Scholar.

data analysis to identify candidate items for each scale and to refine scale items based on content validity and reliability. The final scales were then validated against a range of established measures of both the triarchic model constructs, psychopathy, general personality, and other conceptually relevant constructs.

Initial validation of the MPQ-Tri scales was carried out by Brislin et al. (2015) as part of the scale development process and was further expanded upon by Brislin et al. (2017). While content validity was carefully considered throughout development, the convergent and discriminant validity of the MPQ-Tri Boldness, Meanness, and Disinhibition scales were evaluated using a broad range of criterion measures in both community and prison inmate samples. Across the two studies (Brislin et al., 2015, 2017), substantial evidence for construct validity was observed. For instance, MPQ-Tri Boldness scores were consistently associated with Factor 1 of the PCL-R (in particular, its Interpersonal facet), grandiose narcissism, fearlessness, and a tendency toward sensation seeking. MPQ-Tri Meanness was associated with Factor 1 of the PCL-R (especially its Affective facet) as well as with Factor 2 (in particular, its Antisocial facet), along with emotional empathy, anger, antisocial personality disorder (ASPD), aggressive behavior, and poor social/interpersonal abilities. Lastly, MPQ-Tri Disinhibition was associated robustly with Factor 2 and (to a lesser degree) the PCL-R's Interpersonal facet, trait impulsivity, symptoms of anxiety, conduct disorder symptoms, engagement in delinquent acts, and problems with alcohol and drugs. Thus, initial evidence suggests that the MPQ-Tri scales are effective operationalizations of the triarchic constructs.

More recently, Garofalo et al. (2021) sought to further validate the MPQ-Tri scales using a large at-risk, longitudinal sample that was assessed across four time points from age 16 to age 25. Specifically, they examined the factor structure, longitudinal measurement invariance, and temporal stability of the MPQ-Tri scales over time, as well as the construct validity of the scales based on observed associations between the MPQ-Tri scales and theoretically relevant correlates. Garofalo et al.'s findings demonstrated expected overlap between the Meanness and Disinhibition scales and minimal overlap of either of these scales with Boldness—consistent with Brislin et al. (2015, 2017) as well as with the broader triarchic model literature. Findings from this work also supported the convergent, and to a lesser extent the discriminant, validity of the MPQ-Tri scales, particularly for Boldness, which was associated with theoretically related adaptive and maladaptive correlates. Specifically, Boldness was associated with better self-regulation, social competence, decision making, reduced psychopathology, and fewer internalizing symptoms, as well as self-reported violence, and was largely unrelated to other externalizing symptoms and ASPD. Meanness and Disinhibition were both associated with poor self-regulation, substance use, internalizing and externalizing symptoms, ASPD, and self-reported violence, although Meanness was preferentially associated with ASPD and self-reported violence, and Disinhibition with the remaining aforementioned criterion measures. With regard to temporal stability, Boldness appeared to remain stable across the 9-year follow-up period of this study, whereas Meanness and Disinhibition showed significant decreases across time. Moreover, although associations with criterion measures were somewhat variable over time, the expected pattern of associations became stronger and

clearer with age. Broadly, findings from this work provided further support for the construct validity of the MPQ-Tri scales, along with initial evidence regarding the temporal stability of the scales over time.

Despite these promising findings, further validation research on the MPQ-Tri scales is needed. Both Brislin et al. (2015) and Brislin et al. (2017) used convenience samples that consisted of self-selected volunteers from universities, prisons, and other members of the community, which is likely to impact the generalizability of the findings described. Moreover, Garofalo et al. (2021) relied predominantly on a "high risk" sample that is not immediately generalizable to the general population, and they relied almost exclusively on self-report–based external criterion measures, meaning that shared method variance may have inflated observed correlations. Finally, the MPQ-Tri scales have yet to be evaluated in a population-representative sample. Given these limitations, and because only three studies have evaluated the MPQ-Tri scales to date, these findings should be replicated and extended to further build on the construct validity base of the MPQ-Tri scales, as well as its utility for various populations, before this operationalization can be widely applied.

Furthermore, existing operationalizations of the triarchic constructs have undergone few longitudinal evaluations. Although Garofalo et al. (2021) provided valuable longitudinal evidence regarding the long-term temporal stability of the MPQ-Tri scales, additional longitudinal research would offer the opportunity to further elucidate their temporal stability, as well as determine the predictive (to future ages) validity of these scales. Such findings will enable future longitudinal research to utilize the MPQ-Tri scales to examine highly novel research questions concerning psychopathic personality traits, particularly with respect to both etiology and development over time.

CURRENT STUDY AIMS AND HYPOTHESES

Based on the foregoing considerations, the current study sought to further validate the MPQ-based triarchic scales in a population-representative longitudinal sample (the Dunedin Multidisciplinary Health and Development Research Study, hereafter the Dunedin Study). To date, the Dunedin Study contains a wealth of information regarding the psychopathology, physical health, and psychosocial functioning of a large New Zealand birth cohort across many time points from birth to 45 years of age. A primary benefit of this project would also be to provide an initial step toward leveraging this large and powerful data set to advance our understanding of the triarchic psychopathy constructs in a manner not otherwise currently possible. The adaptation and associated validity of MPQ-Tri scales will thus allow for future psychopathy research to inform upon questions regarding the psychological nature and correlates of the triarchic model constructs and the role they play in understanding antisocial behavior over the life span, as well as other mental health problems, physical health problems, and life outcomes more generally (Bertoldi et al., 2022; Brislin et al., 2015; Wygant et al., 2018).

To this end, the current study specifically sought to validate the MPQ-Tri scales through an examination of the associations between the MPQ-Tri

scales and various measures of personality traits, other conceptually relevant psychopathology, and criminal behavior constructs. This examination included an evaluation of the stability of the MPQ-Tri scale scores over time and the ability of MPQ-Tri scale scores to predict criterion variable scores at a later time point. In order to do so, a modest revision of the existing MPQ-Tri scales was carried out by replacing items that are unavailable in the MPQ Form NZ administered in the Dunedin Study sample with conceptually similar MPQ items to enable the use of the scales in a broad range of samples for which MPQ data are available. This revision process also sought to augment existing MPQ-Tri scales using items from the MPQ-300 that were not available on the MPQ-BF to improve their content validity.

Based on the triarchic psychopathy literature (see Sellbom, 2019; Sellbom et al., 2018, for reviews), hypotheses were generated regarding expected associations with criterion measures in the Dunedin Study sample. For example, it was hypothesized that MPQ-Tri Boldness would be positively correlated with informant-rated extraversion but negatively correlated with informant-rated neuroticism, anxiety, depression, and heart rate. It was also hypothesized that Boldness would be weakly correlated with ASPD and criminal behavior; however, this association was not expected to be as strong as that between MPQ-Tri Meanness and Disinhibition and ASPD or criminal behavior given the inconsistency in the literature, with some studies finding support for such association (e.g., Almeida et al., 2015; Bertoldi et al., 2022; Drislane, Brislin, et al., 2014; Gray et al, 2021; Hall et al., 2014; Laurinavicĭus et al., 2020) and others finding no association (e.g., Brislin et al., 2015, 2017; Garofalo et al., 2021; Venables et al., 2014). In contrast, it was hypothesized that both Meanness and Disinhibition would be positively correlated with conduct disorder/ASPD and criminal behavior, but negatively correlated with informant-rated conscientiousness, agreeableness, and heart rate (Bertoldi et al., 2022; Kyranides et al., 2017). Moreover, it was hypothesized that Disinhibition would be positively correlated with informant-rated neuroticism, as well as with the full range of psychopathology symptoms assessed (Kyranides et al., 2017). In contrast, it was hypothesized that the MPQ-Tri scales would not correlate with theoretically unrelated criterion measures (e.g., Boldness should not be meaningfully correlated with substance dependence symptoms). The full set of a priori hypotheses for each sample are displayed in bold in Tables 1 and 2 and will not be repeated here. When evaluating stability, we hypothesized that we would find a large correlation between respective corresponding psychopathy scale scores at ages 18 and 26. Finally, we hypothesized that psychopathy scale scores at age 18 would predict scores on theoretically associated criterion variables at age 26 (e.g., high Disinhibition at age 18 would predict psychopathology such as alcohol, marijuana, and other forms of drug dependence at age 26).

METHOD

PARTICIPANTS

Archival data for 1,037 participants (502 males and 535 females) derived from the the Dunedin Study were used in the current work. The Dunedin Study is

TABLE 1. Correlations of Revised MPQ-Tri Scales at Ages 18 and 26 of the Dunedin Study

	Age 18			Age 26		
	Boldness	**Meanness**	**Disinhibition**	**Boldness**	**Meanness**	**Disinhibition**
Age 18						
Boldness	**1**	.19**	.16**	**.59****	.13**	.12**
Meanness	.19**	**1**	**.52****	.20**	**.62****	**.43****
Disinhibition	.16**	**.52****	**1**	.11**	**.42****	**.60****
Age 26						
Boldness	**.59****	.20**	.11**	**1**	.17**	.11**
Meanness	.13**	**.62****	**.42****	.17**	**1**	**.54****
Disinhibition	.12**	**.43****	**.60****	.11**	**.54****	**1**

Note. Bold represents hypothesized associations. *$p < .05$. **$p < .01$.

an ongoing longitudinal research project that is investigating a wide range of health, psychological, behavioral, and other outcomes from a New Zealand birth cohort. Participants include 91% of the total infants born between April 1, 1972 and March 31, 1973 in Queen Mary Maternity Hospital (N = 1,037), which is located in Dunedin, New Zealand. Since this time, data have been collected from these individuals at ages 3, 5, 7, 9, 11, 13, 15, 18, 21, 26, 32, 38, and most recently at age 45, when 94% of the living cohort participated. The ethnic distribution of the study participants is comparable to that of the South Island of New Zealand according to the New Zealand census, with the majority being of New Zealand European/Pākeha ethnicity, and 7.5% of participants self-identifying as Māori. Furthermore, participants and their families represented the complete range of socioeconomic status evident in the South Island of New Zealand when the study began during the early 1970s. While around two thirds of participants still live in New Zealand, the remaining living participants reside in various places worldwide, including in Australia (172), the United Kingdom (34), North America (11 United States, 4 Canada), Europe (10), Asia (7), Middle East (3), and Africa (2) (based on age 38 data; see Poulton et al., 2015).

In the current study, both cross-sectional and longitudinal analyses were performed using age 18 and age 26 data. At age 18, the sample was comprised of 993 (97%) of the 1,027 living participants at the time of data collection. Comparably, at age 26, the sample was comprised of 980 (96%) of the 1,019 living participants. These two time points were chosen because participants were within the adult range, the relevant data were available as the MPQ was administered, and a host of other variables conceptually relevant to psychopathy were also measured at these time points.

We also used an archival prison sample (n = 242; 100% men) from Brislin et al. (2015) and an archival undergraduate sample (n = 346; 28% men) from Brislin et al. (2017). These samples were used for the purpose of selecting items for the revised MPQ-Tri scales, as well as for evaluating the similarities of the nomological networks of the revised MPQ-Tri scales compared to those of the

TABLE 2. Overview of Zero-Order Correlation Analyses, and Regression Analyses for MPQ-Based Triarchic Scale Domains Predicting Scores on Psychopathy-Related Variables

	Age 18			Age 26			Predictive			
	Boldness	Meanness	Disinhibition	Boldness	Meanness	Disinhibition	Boldness	Meanness	Disinhibition	
	r	*r*	*r*	*r*	*r*	*r*	β	β	β	R^2
Big-Five Inventory, Informant Report[a]										
Openness	n/a	n/a	n/a	.27**	−.04	−.02	.25**	−.07	−.03	.06**
Conscientiousness	n/a	n/a	n/a	−.07*	**−.20****	**−.35****	−.03	**−.14****	**−.21****	.10**
Extraversion	n/a	n/a	n/a	**.25****	−.17**	−.03	**.17****	−.18**	.04	.05**
Agreeableness	n/a	n/a	n/a	−.04	**−.35****	**−.25****	−.01	**−.22****	**−.09***	.08**
Neuroticism	n/a	n/a	n/a	**−.19****	−.05	**.25****	**−.16****	−.06	**.25****	.07**
Psychopathology										
Depression Symptoms[b]	**−.02**	.08**	**.29****	**−.07***	.07*	**.22****	**−.08***	−.05	**.17****	.03**
Anxiety Symptoms[c]	**−.14****	.07*	**.30****	**−.08***	.18**	**.35****	**−.08***	.01	**.23****	.06**
Conduct Disorder/ASPD Symptoms[d]	.16**	**.47****	**.44****	.23**	**.49****	**.52****	.10**	**.31****	**.19****	.22**
DSM-III-R Substance Dependence Symptoms[e]	.15**	.41**	**.46****	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DSM-IV Alcohol Dependence Symptoms[f]	n/a	n/a	n/a	.16**	.35**	**.42****	.00	.25**	**.16****	.13**
DSM-IV Marijuana Dependence Symptoms[g]	n/a	n/a	n/a	.12**	.34**	**.33****	.01	.25**	**.10****	.10**
DSM-IV Other Drug Dependence Symptoms[h]	n/a	n/a	n/a	.07*	.22**	**.23****	.03	.14**	**.11****	.05**
Criminal Behavior										
Convictions[i]	.03	**.17****	**.19****	−.01	**.24****	**.23****	.02	**.18****	**.11****	.07**
Self-reported Delinquency[j]	.17**	**.40****	**.30****	.07**	**.32****	**.29****	−.11	**.25****	**.12****	.11**
Variety of Crimes[k]	.24**	**.53****	**.49****	.19**	**.43****	**.45****	.13**	**.31****	**.16****	.21**
Heart Rate[l]	**−.16****	**−.10****	**−.09****	**−.17****	**−.10****	**−.04**	**−.07***	**−.13****	**.05**	.02**

Note. Bold represents hypothesized associations; [a]N = 946 (age 26); [b]N = 930 (age 18), N = 976 (age 26); [c]N = 930 (age 18), N = 974 (age 26); [d]N = 930 (age 18), N = 977 (age 26); [e]N = 930 (age 18); [f]N = 976 (age 26); [g]N = 976 (age 26); [h]N = 976 (age 26); [i]N = 931 (age 18), N = 985 (age 26); [j]N = 929 (age 18), N = 798 (age 26); [k]N = 929 (age 18), N = 798 (age 26); [l]N = 869 (age 18), N = 971 (age 26). *p < .05. **p < .01.

original scales by the calculation of intraclass correlation coefficients (ICCs; see below for a more detailed description of analyses). The samples are not described here because they are not the primary focus of this investigation, but they are described in the original publications. They are also summarized in the online supplemental materials.

MEASURES

External criterion measures were selected a priori based on their conceptual relevance to the triarchic model constructs, and with consideration of the existing literature outlined earlier. Given the wide variety of potentially relevant data available in the Dunedin Study, we sought to focus on external criterion measures that we deemed the most conceptually relevant to the triarchic psychopathy constructs. The selected measures and a priori hypotheses were submitted to the Director of the Dunedin Study by way of a concept paper prior to receiving or analyzing the data; this paper was made publicly available on the Dunedin Study website.[2] The introductory and Method sections of the current paper were therefore written before any data analysis took place.

For a list and brief explanation of measures used in the aforementioned undergraduate and prison samples, refer to Table S1 of the online supplemental materials and the information provided in both Brislin et al. (2015) and Brislin et al. (2017). Descriptive statistics and reliability estimates (where applicable) for all criterion measure scores in the Dunedin Study sample are also available in Table S2 of the online supplemental materials. Due to missing data, there were slight differences in samples size for each of the criterion measures at age 18 and age 26 of the Dunedin Study sample; these are available in Table 2.

Multidimensional Personality Questionnaire. A modified form of the MPQ (Tellegen, 1982; Tellegen & Waller, 2008) was developed for use in the Dunedin Study (Form NZ). The MPQ is a self-report questionnaire that provides a broadband measure of normal-range personality. It is comprised of the following 11 trait-based scales: Wellbeing, Social Potency, Achievement, Social Closeness, Stress Reaction, Alienation, Aggression, Control, Harm Avoidance, Traditionalism, and Absorption. The MPQ Form NZ includes 10 trait scales (Absorption scale is not included in MPQ Form NZ), and each scale is comprised of between 11 and 22 items (see Krueger et al., 1996, for further detailed description of the MPQ Form NZ) to constitute a total of 177 items. Items are presented in a lone-statement format with "*true*" or "*false*" responses, or in a forced-choice format with "*a*" or "*b*" responses depending on the statements most relevant to them. The MPQ Form NZ was administered to Dunedin Study participants at ages 18 and 26.

Big Five Inventory. A brief form informant report version of the Big Five Inventory (BFI; John et al., 1991) comprised of 25 items was developed for use in the Dunedin Study. The original BFI is a screening measure that was developed

2. https://dunedinstudy.otago.ac.nz/files/1631843464_Concept%20Paper%20Form%2017-9-2021.pdf

to assess individual differences within the framework of the five-factor model (FFM) of personality (John & Srivastava, 1999). Accordingly, it is comprised of the following five domain-based scales: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. The brief form includes five scales, each comprised of five items. Informants who had been nominated by study participants, most commonly close friends, partners, or family members, were asked to rate the participants on a 5-point Likert scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*). Of the 1,037 participants, 946 had BFI informant data available at age 26. However, BFI informant data were not available at age 18 (see Caspi et al., 2003, and Israel et al., 2014, for other research using BFI in the Dunedin Study sample).

Psychopathology. To assess psychopathology symptoms, structured clinical interviews of the participants at age 18 were conducted according to the Diagnostic Interview Schedule of the *Diagnostic and Statistical Manual of Mental Disorders–Third Edition, Revised* (*DSM-III-R*; American Psychiatric Association [APA], 1987 (Robins et al., 1989), and of the participants at age 26 according the Diagnostic Interview Schedule for the *Diagnostic and Statistical Manual of Mental Disorders–Fourth Edition* (*DSM-IV*; APA 1994) (Robins et al., 1995). The reporting period was the past 12 months. All symptom counts were based on the diagnostic system current for the age cohort, using the *DSM-III-R* and the *DSM-IV*. We selected disorders that have been examined in the context of psychopathy in the past and therefore about which hypotheses could be generated with respect to the three triarchic psychopathy domains: Depression as indicated by the presence of Major Depressive Episode symptomatology; Anxiety as represented by Generalized Anxiety Disorder symptomatology; Conduct Disorder, which was replaced with ASPD at age 26 due to the solely developmental nature of Conduct Disorder diagnostic criteria; Substance Dependence symptomatology at age 18 (*DSM-III* diagnostic criteria did not distinguish between substances), which was replaced by Alcohol Dependence symptomatology, Marijuana Dependence Symptomatology; and Other Drug Dependence symptomatology at age 26. Symptom ratings were made on a continuous scale for each of the aforementioned disorders by calculating the sum of the participant's scores on interview symptom items relevant to each domain. The greater the symptom count, the more symptoms of psychopathology an individual was experiencing.

Convictions. Official conviction records of the participants were obtained both at age 18 and age 26 from the New Zealand Police by a search of the central database. The official records captured New Zealand convictions, as well as any Australian convictions known to the New Zealand Police.

Self-Reported Delinquency. A criminal offending interview was conducted to retrospectively measure the frequency and variety of self-reported criminal offending within the previous year. This interview was conducted at age 18 and age 26. Four broad offense types were assessed, each of which encompassed various specific offenses: property offenses (e.g., vandalism, shoplifting,

fraud), rule offenses (e.g., reckless driving, providing false information, disobeying court orders) drug-related offenses (e.g., using or selling illicit drugs), and violent offenses (e.g., aggravated assault, robbery, rape). Responses to a particular offense *item* contributed to an overall frequency count referred to as Self-Reported Delinquency, with higher scores indicating engagement in a greater number of individual delinquent acts. A Variety of Crimes score was calculated by summing 1 point for each "yes" response to having committed at least one offense of that *type* over the 12-month reporting period. Variety scores ranged from 0 to 30, with higher scores indicating more extensive crime involvement across the various offense types assessed (see Beckley et al., 2018, Moffitt et al., 2001, and Wright et al., 2004, for further detailed descriptions of offense variables).

Heart Rate. Resting heart rate was measured using a Polar heart rate monitor during an assessment of cardiovascular health and is reported in beats per minute. At age 18, heart rate was measured three times within a 50-min assessment; however, at age 26, heart rate was measured five times within a 50-min assessment. At both ages, resting heart rate is reported as an average across the number of time points at which it was measured.

PROCEDURE

The Dunedin Study has used a similar basic research procedure for every phase of data collection; this includes ages 18 and 26. Participants were brought into the research unit within 60 days of their birthday for a full day of individual data collection. Across the day-long visit, data were collected for various research domains, including personality assessment, mental health, delinquency interview, and physical examination, which are relevant to the current study, among various others. Examiners were trained for the domains they were involved in, and the order in which the domains were presented was counterbalanced across participants. Personality assessment required participants to complete the MPQ self-report questionnaire. At age 26, participants were required to nominate individuals who knew them well (e.g., partner, family, friends) to act as informants. Nominated informants were then mailed the relevant information and asked to describe the participant using the brief-form BFI. The mental health component of assessment involved a semi-structured clinical interview in which participants answered questions relating to various *DSM-III-R* and *DSM-IV* diagnoses. Interviewers were blind to information pertaining to the participant's mental health status and any other data previously collected as part of the Dunedin Study. As part of the offending interview, participants were asked about the delinquent behavior they had engaged in over the previous 12 months. Conviction data were sought from official records. In New Zealand, conviction is permissible from the age of 14 years, so the total number of convictions from age 14 was measured for each participant. Lastly, heart rate was measured as one component of the physical examination. This procedure was approved by the University of Otago Human Ethics Committee.

SCALE REVISION PROCESS

Given that the version of the MPQ administered in the Dunedin Study was an abbreviated (177-item) form of the MPQ-300, and that Brislin et al. (2015) employed an alternative 155-item brief form (MPQ-BF; Patrick et al., 2002) to develop the MPQ-Tri scales, items comprised of the existing MPQ-Tri scales were not fully available in the Dunedin Study sample. Specifically, 15 of the 20 Boldness scale items, 14 of the 16 Meanness scale items, and 16 of the 18 Disinhibition scale items were available. This necessitated the replacement of missing items with other available items that measured the same content, but it also offered an opportunity to bolster the scales' content coverage for use in samples in which the full-length form of the MPQ was administered.

The selection of replacement items was completed in an iterative manner similar to that conducted in previous scale development research and is described in detail in the introductory section of this article, via consideration of item content, examination of improvements in adjusted item-total correlations, and internal consistency. Additional items that were perceived to access relevant content but had not been selected as replacement items were then considered in the same manner to establish whether they may augment the scales by bolstering their psychometric properties and content validity. This process was undertaken with the archival prison sample derived from Brislin et al. (2015) and the archival undergraduate sample derived from Brislin et al. (2017) (both of which administered the full MPQ-300), in addition to the 18- and 26-year-old participants in the Dunedin Study sample. It is important to note here that neither the original nor the revised MPQ-Tri scales contain criterion contamination with respect to antisocial behavior as do other psychopathy measures, because all items of these scales reflect personality traits rather than behavioral outcomes. For further description of the scale revision process, refer to the online supplemental materials. A complete list of scale items—including original MPQ-Tri scale items not available in the Dunedin Study and the replacement items for each scale—are provided in Tables S3, S4, and S5 of the online supplemental materials. Descriptive statistics—including the central tendency and dispersion of the revised MPQ-Tri scales scores in both Dunedin Study samples, as well as the Undergraduate and Prison samples—are available in Table S6 of the online supplemental materials.

INTERNAL CONSISTENCY

Analyses of internal consistency (Cronbach's α) for each of the original and revised MPQ-Tri scales in the prison sample revealed that the revised scales showed the same or better reliability when compared with their original counterparts. Cronbach's α for the revised Boldness, Meanness, and Disinhibition scales were .78, .71, and .81, respectively, compared to .73, .70, and .81 for the original MPQ-Tri scales. Similarly, in the undergraduate sample, analyses of internal consistency revealed corresponding αs of .77, .76, and .76 for the revised scales, compared with .74, .76, and .76 for the original MPQ-Tri scales.

INTRACLASS CORRELATIONS

Further analyses were carried out in both prison and undergraduate samples derived from Brislin et al. (2015) and Brislin et al. (2017) in order to evaluate the comparability of the revised scales to their original counterparts. Specifically, correlations between the revised MPQ-Tri scale scores and their original counterparts, as well as intercorrelations between the revised MPQ-Tri scale scores in the undergraduate and prison samples, revealed associations consistent with expectations (see Tables S7 and S8 in the online supplemental materials for these results). ICCs (two-way random models, absolute agreement) were calculated to quantify the level of agreement between the original MPQ-triarchic scales and the revised scales in their relative associations with various criterion measures. The online supplementary materials provide the full set of correlations (see Tables S9 and S10). The results show that the revised MPQ-Tri scales demonstrated substantial agreement with the original MPQ-Tri scales in their relative associations with external criterion measures in both the undergraduate and prison samples. Specifically, the ICC in the undergraduate sample for Boldness was .98 (95% CI [.96, .99], $p < .001$), for Meanness .98 (95% CI [.95, .99], $p < .001$), and Disinhibition .99 (95% CI [.97, .99], $p < .001$). Similarly, the ICC in the prison sample for Boldness was found to be .98 (95% CI [.97, .99], $p < .001$), for Meanness .96 (95% CI [.92, .98], $p < .001$), and Disinhibition .99 (95% CI [.99, 1.00], $p < .001$).

FACTOR ANALYSES

Per Somma et al.'s (2019) recommendations for factor analyses of triarchic scales (see also Patrick et al., 2021), a bifactor exploratory structural equation modeling (ESEM) analysis was conducted for each of the revised MPQ-Tri scales at age 26 of the Dunedin Study sample using Mplus Version 8.7 (Muthén & Muthén, 1998–2017). Because MPQ items are binary (true/false), we used the mean- and variance-adjusted weighted least squares estimator for categorical data. For the general factor and orthogonal group factor solution, the default bigeomin rotation method was employed. We interpreted loadings of |.30| or larger as meaningful.

As expected, these bifactor ESEM analyses revealed a Boldness general factor with items exhibiting a median factor loading of .517 (range .199–.692), with only three items not meeting the threshold for |.30| loading. Meanness items had a median factor loading on the general factor of .468 (range .200–.900), with three items not meeting the threshold for |.30| loading. Disinhibition items had a median factor loading on the general factor of .462 (range .258–.729), with only one item not meeting the threshold for |.30| loading. Each model also revealed a group factor structure that closely resembled the natural structure of the MPQ. For all three MPQ-Tri scales, the bifactor ESEM unsurprisingly showed better relative model fit when compared with a single-factor confirmatory factor analysis (CFA) model for that scale. Table S11 in the online supplementary material shows model fit statistics for these alternative models of each scale. Bigeomin rotated factors loadings for

the best-fitting ESEM model of each MPQ-Tri scale are displayed in Tables S12, S13, and S14 in the online supplementary material.

Of note, the item-sum scores for the three MPQ-Tri scales used in our main analyses correlated very highly with regression-estimated scores for their counterpart factors from the best-fitting ESEM model (*r*s = .98, .92, and .95 for Boldness, Meanness, and Disinhibition, respectively). These high correlations indicate that the sum scores effectively captured the broad trait indexed by each of the scales.

DATA ANALYSES

Following the process of scale development, the temporal stability, construct validity, and predictive validity of each scale were evaluated at ages 18 and 26 of the Dunedin Study sample. Specifically, temporal stability was assessed across an 8-year period by calculating the correlations between the revised MPQ-Tri scale scores at age 18 with the respective corresponding scores at age 26. Convergent and divergent validity was assessed by calculating the correlations between the MPQ-Tri scores for each revised scale and various criterion measures. In addition, multiple linear regression models were estimated in order to prospectively assess the predictive validity of the revised MPQ-Tri scales. Specifically, MPQ-Tri scale scores at age 18 were entered into a regression equation predicting criterion variable scores at age 26 to establish the unique contribution of the revised MPQ-Tri scales to the prediction of criterion measures later in life. Criterion measure scores at age 18 were not included in these predictive validity analyses. Data analysis code for each of the analyses described above (including the factor analyses) as well as the means, standard deviations, and correlation and covariances matrices for all variables included in the Dunedin Study, undergraduate and prison samples, are publicly available on Open Science Framework.[3]

RESULTS

INTERNAL CONSISTENCY

For age 18, analyses of internal consistency in the Dunedin Study sample revealed .71 Boldness, .72 Meanness, and .80 Disinhibition.[4] Analyses of internal consistency (Cronbach's α) of each of the scales at age 26 of the Dunedin Study participants revealed .79 Boldness, .77 Meanness, and .76 Disinhibition.

TEMPORAL STABILITY OF MPQ-BASED TRIARCHIC SCALES

The revised MPQ-Tri scales demonstrated good temporal stability, as Boldness, Meanness, and Disinhibition scale scores at age 18 demonstrated consistently

3. https://osf.io/rg9sh/

4. The Spearman-Brown correction was applied to calculate internal consistency in the age 18 Dunedin Study cohort because some of the revised MPQ-Tri scale items were not administered at this time point.

large correlations with respective corresponding scale scores at age 26 (see Table 1). Correlations among the revised MPQ-Tri scales also demonstrated similar patterns at both time points that were consistent with hypothesized associations. Notably, there was evidence of small positive correlations of Boldness with both Meanness and Disinhibition, and moderate to large correlations between Meanness and Disinhibition.

CONSTRUCT VALIDITY AND PREDICTIVE VALIDITY

Zero-order correlations between the three revised MPQ-Tri scales and external criterion measures were calculated at both age 18 and age 26, along with regression coefficients for the MPQ-Tri scale scores at age 18 in predicting external criterion measures at age 26. The results of these analyses are displayed in Table 2, with hypothesized associations appearing in boldface.

Boldness. Evidence pertaining to informant-rated FFM personality domains illustrated that, as expected, Boldness showed a medium positive correlation with BFI Extraversion and a small negative correlation with BFI Neuroticism at age 26. Moreover, Boldness uniquely predicted both BFI Extraversion (+) and BFI Neuroticism (–) over time. Contrary to the hypotheses, however, Boldness also showed a medium positive correlation with BFI Openness and a very small negative correlation with BFI Conscientiousness at age 26, although Boldness was only found to be a significant and unique predictor of BFI Openness over time.

With regard to psychopathology, the expected negative associations for Boldness with Depression and Anxiety symptoms were very small to small and were significant with the exception of depression at age 18. Predictive regression analyses revealed that Boldness uniquely predicted fewer symptoms of Depression and Anxiety over time. In contrast with the hypotheses, Boldness showed small to medium correlations with Conduct Disorder symptomatology at age 18 and ASPD symptomatology at age 26, and was found to uniquely contribute to the prediction of ASPD symptoms over time. Moreover, very small to small positive correlations were found between Boldness and Substance Dependence symptoms at age 18 as well as Alcohol, Marijuana, and Other Drug Dependence symptoms at age 26. Boldness did not uniquely predict Alcohol, Marijuana, or Other Drug Dependence over time.

In relation to criminal behavior, as tentatively expected, analyses revealed a very small to medium correlation between Boldness and Self-Reported Delinquency, as well as Variety of Crimes at both time points. Although Boldness did not uniquely predict Self-Reported Delinquency over time, this scale did uniquely predict engagement in a greater variety of crimes over time. Furthermore, as expected, negative correlations were observed between Boldness and heart rate at both time points at a medium effect size, and Boldness at age 18 negatively and uniquely predicted heart rate at age 26.

Meanness. Findings supported hypothesized associations between Meanness and informant-rated FFM personality domains. Specifically, Meanness was found to be associated with lower informant ratings of both BFI

Conscientiousness and BFI Agreeableness at age 26, as evidenced by medium to large effect sizes. Moreover, Meanness was found to negatively and uniquely predict these BFI-assessed traits over time. Unexpectedly, Meanness also showed small negative correlations with BFI Extraversion at age 26, with Meanness at age 18 also being found to uniquely predict BFI Extraversion at age 26.

With regard to psychopathology, as expected, Meanness was found to be positively correlated with Conduct Disorder at age 18, and with ASPD at age 26 as evidenced by very large effect sizes. Furthermore, Meanness scores at age 18 uniquely predicted a greater number of ASPD symptoms at age 26. In contrast to study hypotheses, analyses also revealed very small to small positive correlations for Meanness with both Depression and Anxiety at both time points, as well as medium to very large correlations with Substance Dependence at age 18, and Alcohol, Marijuana, and Other Drug Dependence at age 26. Meanness was also unexpectedly found to uniquely predict Alcohol, Marijuana, and Other Drug Dependence over time even when accounting for Disinhibition in the model.

Analyses relating to criminal behavior yielded results in line with hypotheses, as positive correlations were found between Meanness and criminal convictions, Self-Reported Delinquency, and Variety of Crimes at both time points. The effect sizes for these associations ranged from small to very large. In addition, Meanness was found to uniquely predict greater future likelihood of convictions and Self-Reported Delinquency, as well as engagement in a greater variety of crimes over time.

As shown in Table 2, Meanness was negatively correlated with heart rate at both time points, as evidenced by very small to small effect sizes. Moreover, Meanness scores at age 18 negatively and uniquely predicted heart rate at age 26 even when accounting for Boldness in the model.

Disinhibition. As expected, analyses pertaining to FFM personality domains revealed medium to large negative correlations between Disinhibition and informant ratings of BFI Conscientiousness and BFI Agreeableness, and a medium positive correlation between Disinhibition and BFI Neuroticism at age 26. Further supporting the hypotheses, Disinhibition scores at age 18 were found to uniquely predict lower BFI Conscientiousness and BFI Agreeableness, as well as higher BFI Neuroticism, over time.

With regard to psychopathology, Disinhibition, as expected, showed medium to very large positive associations with each of the criterion measures at both time points, namely, Depression, Anxiety, and Conduct Disorder/ASPD, as well as Substance Dependence at age 18, and Alcohol, Marijuana, and Other Drug Dependence at age 26. Consistent with hypotheses, Disinhibition was also found to uniquely predict greater numbers of symptoms across each of the seven aforementioned psychopathology measures over time.

In relation to criminal behavior, Disinhibition was found to demonstrate small to very large positive correlations with Convictions, Self-Reported Delinquency, and Variety of Crimes at both time points. Moreover, Disinhibition was found to uniquely predict greater future likelihood of Convictions and Self-Reported Delinquency, as well as engagement in a greater variety of crimes

over time. Finally, consistent with expectations, Disinhibition demonstrated a very small negative correlation with heart rate at age 18, although a significant correlation was not observed at age 26. Contrary to expectations, Disinhibition did not uniquely contribute to the prediction of heart rate over time.

DISCUSSION

The current findings replicate and extend those of Brislin et al. (2015), Brislin et al. (2017), and Garofalo et al. (2021) in elaborating on the psychometric properties of the MPQ-based triarchic scales. Moreover, the current study establishes the MPQ-Tri scales as a basis for assessing psychopathic personality traits in the Dunedin Study data set in order to advance our understanding of the triarchic constructs. More specifically, we reported promising evidence to support the temporal stability, construct validity, and predictive validity of the MPQ-based triarchic scales in a population-representative and longitudinal sample outside of the United States. Moreover, the MPQ-Tri scales were amenable to minor modifications using additional items from the MPQ Form NZ (which are also available in the full MPQ-300) and demonstrated acceptable internal consistency across ages 18 and 26 of the Dunedin Study. Thus, such modifications enable their use in a broader range of samples previously not accessible to psychopathy research such as the Dunedin Study. Notably, the revised MPQ-Tri scales showed good temporal stability, indicating that the MPQ can be used to reliably capture the triarchic constructs over time. The MPQ-Tri scales also demonstrated a pattern of convergent and divergent associations with conceptually relevant criterion measures that were highly consistent with those observed using the original scales and other operationalizations of the triarchic constructs (e.g., TriPM). Furthermore, the revised MPQ-Tri scales demonstrated a pattern of associations with criterion measures novel to MPQ-based triarchic scale validation analyses (e.g., Self-Reported Variety of Crimes and heart rate) that would be expected in light of existing literature regarding other triarchic psychopathy measures such as the TriPM (e.g., Almeida et al., 2015; Kyranides et al., 2017; see Sellbom, 2019, for a review). Finally, the findings elucidate the ability of the revised MPQ-Tri scales to predict relevant criterion measures over time, thus providing support for the predictive validity of the MPQ-based triarchic scales. Overall, these findings provide evidence to support the temporal stability, as well as the convergent and predictive validity, of the MPQ Boldness, Meanness, and Disinhibition scales.

It is important to note, however, the present study yielded some unexpected findings with respect to the divergent validity of the MPQ-Tri scales that warrant further discussion, the first being the medium-level associations of Boldness with ASPD symptoms and indicators of self-reported delinquent behavior. These findings are inconsistent with results from a number of other triarchic psychopathy studies that have reported very small or negligible effect sizes for relations between Boldness and ASPD (e.g., Brislin et al., 2015, 2017; Garofalo et al., 2021; Sleep et al., 2019; Wall et al., 2015). Such findings have led some researchers in the field to question the relevance of the boldness

facet of the triarchic model to psychopathy (see Lilienfeld et al., 2018, and Sellbom, 2019, for reviews). However, an increasing amount of research has found support for significant positive relationships of boldness with ASPD as well as with antisocial and criminal behavior (e.g., Bertoldi et al., 2022; Drislane, Brislin, et al., 2014; Hall et al., 2014; Sellbom et al., 2015, 2022), and in some cases with self-reported delinquency and proactive violence (Almeida et al., 2015; Gray et al., 2021; Laurinavicĭus et al., 2020). In addition, Boldness performed as expected in relation to all other criterion measures in the current study, lending additional empirical support for its inclusion as a facet of psychopathy.

An explanation for the robust associations of Boldness with ASPD and self-reported delinquency in the current study may lie in our use of a population-representative community sample rather than a convenience sample of undergraduate students, prisoners, or an at-risk community sample. Owing to greater population representativeness, the current study sample may exhibit less range restriction than much of the aforementioned literature, allowing for greater associations to emerge for Boldness with ASPD and delinquent behavior. Existing research appears to support this possibility, because community samples that better reflect the range of ASPD symptoms and criminal behavior in the general population (e.g., Almeida et al., 2015; Bertoldi et al., 2022; Drislane, Brislin, et al., 2014; Sellbom et al., 2022) tend to yield stronger associations for boldness with these criteria than studies using nonrepresentative samples. Nonetheless, current study findings highlight the need for further research aimed at elucidating the relationship between boldness and antisocial/criminal behavior, which is not yet well understood. As highlighted in recent conceptual reviews (Patrick, 2022; Wygant et al., 2018), the availability of validated triarchic trait scales in prospective longitudinal data sets like that of the Dunedin study will be enormously valuable in this regard.

Another unexpected finding was that Meanness as indexed by the MPQ was associated with substance dependence at age 18, as well as with alcohol, marijuana, and other forms of drug dependence at age 26—at levels exceeding observed associations for Disinhibition in some cases. While this could reflect a weakness in the validity of the revised MPQ Meanness scale, or perhaps the triarchic model more broadly, Lynam and Miller (2019) have presented evidence that the broad trait of antagonism—which served as a specific referent for the construct of meanness in the triarchic model (Patrick et al., 2009)—shows robust positive associations with substance use measures. Despite this corroborative evidence, it is nevertheless surprising that Meanness predicted substance use better than Disinhibition, given that its association with disinhibition is better established in the literature (e.g., Brislin et al., 2015, 2017; Sellbom et al., 2015). Further research is needed to clarify the comparative associations of meanness and disinhibition with substance use.

IMPLICATIONS

Overall, the findings of the present study provide relatively good evidence to support the temporal stability and validity of the revised MPQ-Tri scales, especially with regard to Disinhibition. As expected, due to the very large degree of

overlap with their original scale counterparts, the revised MPQ-Tri scales are comparable to the original MPQ-Tri scales in measuring the triarchic model constructs. Moreover, the same pattern of associations with criterion measures compared to previous research suggests that the revised MPQ-Tri scales appear to index constructs very similar to other existing measures of the triarchic domains such as the TriPM. In light of such promising evidence, the current findings add to the existing literature supporting the construct validity of the MPQ-based triarchic scales by providing evidence of the scales' concurrent and predictive validity over time in a population-representative and longitudinal sample outside the United States. More importantly, however, it appears that the revised MPQ-Tri scales enable the measurement of psychopathy in samples in which existing operationalizations of the triarchic psychopathy constructs are unable to be utilized. The Dunedin Study is one such sample that provides a uniquely valuable opportunity to clarify the development of triarchic psychopathy constructs, as well as their etiological role in later psychopathology, health problems, and other broader life outcomes. Moreover, the longitudinal nature of the Dunedin Study allows causal inferences to be made, as well as access to multiple measurement modalities (e.g., self-report, informant report, clinical diagnostic, physiological, and neuroimaging data), enhancing the confidence with which we can report future findings.

The importance of these findings is evident as they indicate that the range of psychopathic personality traits within the broader community can be reliably and validly assessed using the MPQ-Tri scales. This will allow for greater research inquiry about triarchic psychopathy using the MPQ. For example, recent literature has begun to explore the triarchic constructs as neurobehavioral constructs situated within broader psychopathology (Latzman et al., 2019; Patrick & Drislane, 2015; Patrick et al., 2012). It has been suggested that this perspective may enable the development of focused interventions that target the cognitive and affective deficits associated with specific facets of psychopathy (Patrick et al., 2012). Such research will make an important contribution to an area of psychopathy in which little is known and will no doubt benefit from being carried out in large, complex samples, with wide variety of variables such as the Dunedin Study. It is evident that, based on the current findings, the MPQ-Tri scales will enable the measurement of psychopathy in such samples.

STRENGTHS, LIMITATIONS, AND FUTURE DIRECTIONS

The current study has a number of strengths given the use of a large, population-representative sample, as well as a multimethod assessment approach to construct validation, which included information gathered by informant report, self-report, and interviews. Furthermore, the use of two time points in a longitudinal sample afforded results which inform both the temporal stability, and predictive validity of the MPQ-Tri scales.

Despite these strengths, some limitations must also be considered. The use of archival data meant that the present study was constrained to the measures available in the Dunedin Study sample. Despite the availability of a wide range of useful criterion measures, the inclusion of alternative measures

of the triarchic psychopathy constructs as well as other conceptualizations of psychopathy (e.g., the TriPM and PCL/PCL-R) may have further contributed to the evaluation of the validity of the MPQ-Tri scales in a population-representative community sample. Nevertheless, the findings are broadly consistent with theoretical expectations, as well as with the existing body of empirical work. Furthermore, the absence of additional psychopathy measures meant that the assessment of psychopathic personality traits in the current study was constrained to self-report information. It has been suggested that due to their tendency to be deceptive and to have limited insight into their pathology, individuals high in psychopathic personality traits may not accurately report their personality functioning (e.g., Kelsey et al., 2015; Lilienfeld, 1994; Sellbom et al., 2018). Despite such concerns, little research has empirically evaluated the validity of self-report information, although research that has done so indicates that individuals can and generally do accurately disclose such information, particularly if they are provided assurance that there will be no negative consequences for them (e.g., criminal repercussions) (Kelley et al., 2017; Miller et al., 2011). The Dunedin Study has placed long-standing emphasis on confidentiality, enhancing reports on delicate subject matter such as personality functioning and associated behaviors (Poulton et al., 2015), therefore providing increased confidence in the accuracy of the MPQ-Tri psychopathy scores.

Future research should seek to further validate the MPQ-Tri scales by replicating the findings of the present study alongside comparisons with additional criterion measures. Given the current findings pertaining to the predictive validity of the MPQ-Tri scales, research into the applied utility of these scales (e.g., in predicting future risk of reoffending in a way that may benefit the criminal justice system) is needed. Moreover, research should use these scales in samples that include the MPQ, which can help to further address unanswered questions about triarchic psychopathy, including genetics, neurobiological evidence, and the influence of other important environmental and contextual factors on these personality domains.

Overall, the present study indicates that the MPQ-based triarchic scales appear to provide a useful measure with which to assess the domains of the triarchic model of psychopathy in a variety of samples. This will not only facilitate future psychopathy research but may also help contribute to further understanding of the development and course of psychopathology, health, and life outcomes of other kinds if used in a broad range of diverse samples. While further validation of the scales is required, particularly against other relevant criterion measures, the results of the present study provide encouraging evidence for the validity of these scales.

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SUPPLEMENTARY MATERIALS

Construct Validity of Triarchic Model Traits in the Dunedin Multidisciplinary Health and Development Study Using the Multidimensional Personality Questionnaire

Method

Participants

Undergraduate Sample

Participants were derived from an archival sample of 346 university students recruited from Florida State University (see Brislin et al., 2017, for greater detail). The sample consisted of 248 females, and 98 males, with an overall mean age of 18.8 years (*SD* = 2.4). Participants racial/ethnic composition was Caucasian (88.5%), African American (11.5%), and Hispanic (5.5%). The percentages provided add to greater than 100% as participants were able to select more than one ethnic identity.

All data was collected in a single in-person session in which participants answered all questionnaires, underwent a psychophysiological testing session, and a semi-structured clinical interview in which the protocol of all interview measures was administered. Participants were remunerated with course credit for their involvement in the study.

Prison Sample

Participants were derived from an archival sample of 242 offenders in a low–medium security Federal Correctional Institution in Tallahassee, Florida (see Brislin et al., 2015, for greater detail). The sample was comprised entirely of adult males with a mean age of 32.7 (*SD* = 7.75). The largest ethnic/racial groups were Caucasian (47.1%), African American (39.6%), and Hispanic (12.9%). The percentages provided add to greater than 100% as participants were able to select more than one ethnic identity. Offence histories included one or more non-violent charge for 95.9% of participants, and one or more violent charge for

69.9% of participants. Two participants were excluded from analyses due to evidence of inconsistent responding to the MPQ Variable Response Inconsistency scale, resulting in a final sample of 240 offenders.

Volunteer participants were randomly recruited from the prison roster. Inclusion criteria required that all participants had no diagnosed mental health problems. Data collection took place across two phases, in which participants underwent a semi-structured clinical interview and were also required to complete various self-report questionnaires. Information from criminal records, mental health records and prison files was gathered and coded or rated by experimenters.

Measures

Measures included in the aforementioned undergraduate and prison samples are displayed in Table S1.

Table S1

Measures included in the undergraduate and prison samples

Measure	Sample	Type/ Items	Content	Subscales
California Psychological Inventory (CPI; Gough, 1956) Socialization Scale	U & P	SR/54	Lower Socialization Scores are indicative of more involvement in delinquent behavior	
Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988)	U & P	SR/40		Total Score Authority Exhibitionism Superiority Entitlement Exploitativeness Self-Sufficiency Vanity
Sensation Seeking Scale (SSS; Zuckerman et al., 1979)	U & P	SR/40		Total Score Disinhibition Boredom Susceptibility Thrill & Adventure Seeking Experience Seeking
Fear Survey Schedule III (FSS-III; Arrindell et al., 1984)	U & P	SR/52	Primarily used to assess phobic anxiety	Total Score Social Fear Agoraphobic Fear Bodily Injury Fear Death/Illness Aggression/Sex-Related Fear Animal Fears
Emotionality Activity Sociability and Impulsivity Survey (EASI; Buss & Plomin, 1975)	U & P	SR/25		Fearfulness Anger Distress Sociability Activity Impulsivity
Emotional Empathy Scale (EES; Mehrabian & Epstein, 1972)	U	SR/33	Assesses affective sensitivity, and ability to experience the emotional states of others	

Taylor Manifest Anxiety Scale (TMAS; Taylor, 1953)	U	SR/50	Assesses physical and emotional symptoms of anxiety	
Questionnaire Upon Mental Imagery (QUMI; Sheehan, 1967)	U	SR/35	Responses reversed so that higher total score is indicative of better imagery ability	Assesses the ability to imagine five sensory modalities: visual, auditory, olfactory, gustatory, and tactile experiences
Psychopathy Checklist-Revised (PCL-R; Hare, 2003)	P	SSI/20 OR		Total score Factor 1 (affective–interpersonal symptoms) Affective Facet Interpersonal Facet Factor 2 (impulsive–antisocial symptoms) Impulsive–Irresponsible Facet Antisocial Facet
Antisocial Personality Disorder (ASPD)	P	SI	Conducted to assess child and adult symptoms of Antisocial Personality Disorder according to the DSM-IV diagnostic criteria	Total Symptoms Child Conduct Disorder Symptoms Adult Antisocial Behavior Symptoms
Aggressive Acts coded from interview/files	P	I PF	Overall estimate of the frequency of aggressive behavior	Total number of childhood fights Total number of adult fights Number of violent charges
Alcohol Dependence Scale (ADS; Skinner & Allen, 1982)	P	SR/29	Higher scores indicate problematic use of alcohol	
Short Drug Abuse Screening Test (SDAST; Skinner, 1982)	P	SR/20	Higher scores indicate more problems relating to drug taking behavior	
NEO-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992)	P	SR/60	Measures the five-factor model of normal personality	Neuroticism Extraversion Openness Agreeableness Contentiousness
Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)	P	SR/20		Positive Affect Negative Affect
Beck Depression Inventory (BDI/BDI-II; Beck et al., 1961, 1996)	P	SR/21	Assesses key symptoms of depression with higher scores indicative of more symptoms experienced	
State-Trait Anger Expression Inventory (STAXI; Spielberger, 1988)	P	SR/20	Measures both the expression and regulation of anger looking specifically at the outward expression of anger, inward expression of anger, and the ability to suppress angry outbursts	Total Score Anger In Anger Out Control

Shipley Institute of Living Scale (SIL; Shipley, 1940)	P	SR/60	Assesses vocabulary knowledge, and abstract problem-solving skills	Total Score Verbal Abstraction

Note. U = undergraduate sample, P = prison sample, SR = self-report, SSI = semi-structured clinical interview, SI = structured clinical interview, I = interview, OR = official records, PF = prison files.

Table S2

Reliability statistics for all measures included in each age in the Dunedin Study sample

Measure	Mean	Min	Max	*SD*	Reliability
Age 18					
Psychopathology					
Depression Symptoms	15.76	0	99	29.89	.73 (κ)
Anxiety Symptoms	19.01	0	99	28.48	.49 (κ)
Conduct Disorder Symptoms	11.51	0	99	29.80	n/a (κ)
DSM-III-R Substance Dependence Symptoms	16.04	0	99	29.68	.88 (κ)
Criminal Behavior					
Convictions	.49	0	68	3.25	n/a
Self-reported Delinquency	123.18	0	2961	294.68	.88 (α)
Variety of Crimes	4.81	0	30	4.78	n/a
Heart Rate	65.57	20	99	10.52	n/a
Age 26					
Big 5					
Openness	6.43	0	10	2.02	.85 (α)
Conscientiousness	6.96	0	10	1.75	.81 (α)
Extraversion	6.35	0	10	1.81	.79 (α)
Agreeableness	7.61	0	10	1.51	.75 (α)
Neuroticism	3.78	0	10	1.92	.83 (α)
Psychopathology					
Depression Symptoms	5.23	0	54	10.51	>.85 (κ)
Anxiety Symptoms	9.20	0	60	10.89	>.85 (κ)
ASPD Symptoms	4.49	0	32	4.56	>.85 (κ)
DSM-IV Alcohol Dependence Symptoms	5.15	0	28	7.75	>.85 (κ)
DSM-IV Marijuana Dependence Symptoms	1.84	0	24	4.40	>.85 (κ)
DSM-IV Other Drug Dependence Symptoms	.81	0	50	3.58	>.85 (κ)
Criminal Behavior					
Convictions	1.35	0	91	6.212	n/a
Self-reported Delinquency	117.19	0	2577	287.09	.90 (α)
Variety of Crimes	3.06	0	26	3.41	n/a
Heart Rate	71.40	41.20	107.60	10.73	n/a

Note. n/a indicates measures for which reliability estimates are not available.

Scale Revision Process

Here we provide full details of the scale revision process that were summarized in the main article. To begin the scale revision process, a Construct Definition Form (Hall et al., 2014) containing narrative definitions for each of the domains described in the Triarchic Model of Psychopathy (*boldness, meanness,* and *disinhibition)* was provided to two raters (one clinical psychology postgraduate student and one academic psychopathy expert). The raters independently identified items exclusive to the MPQ Form NZ (i.e., items not also in the MPQ-BF) that were perceived to access content relevant to each of the triarchic model constructs by rating items as a *"good fit"* or a *"very good fit"* with the associated scale. Candidate items were selected based on consensus across the two raters. In total, there were 15 candidate items for the boldness scale, 12 for meanness, and 11 for disinhibition. Candidate items were then given to an external psychopathy expert, who developed the triarchic psychopathy model, including the original MPQ-Tri scales (Christopher J. Patrick). This expert provided recommendations for items that would best serve as replacements for MPQ-Tri items not available in the MPQ Form NZ.

Initial scales were developed through a systematic iterative process of evaluating each candidate item independently using multiple steps of analyses whereby both convergence of the item with other items in the scale (i.e. adjusted item-total correlation), and the divergence of the item from items in other scales (i.e. substantially weaker association with other non-target scale scores) was evaluated. This was undertaken in the archival prison sample derived from Brislin et al. (2015), and the archival undergraduate sample derived from Brislin et al. (2017) (both of which administered the MPQ-300), in addition to ages 18 and 26 of the Dunedin Study sample. Items were selected as replacement items in the scales if their inclusion did not detract from internal consistency (Cronbach's α and average inter-item correlation). The content of the item was also evaluated to ensure the relevant psychopathy

features germane to each triarchic construct of each scale was retained in replacement items.

Potential additional candidate items that were not already selected as replacement items were then considered to augment the current scales to achieve even greater content validity given that the original scale development effort had restricted itself to the 155-item version of the MPQ. These items were evaluated to establish whether they may bolster the scales' psychometric properties and content validity. This process was completed in a similar iterative manner, via consideration of item content, and examining improvements in adjusted item-total correlations, and internal consistency. Items were carefully considered before they were selected for inclusion to avoid an excessive number of additional items and to ensure the scales remained comparable to their original counterparts. Overall, this iterative process of evaluating both replacement and bolster items resulted in the addition of 5 boldness, 6 meanness, and 4 disinhibition candidate items that were found to be optimal.

After final consultation with Christopher J. Patrick, the scales were finalized. The final Boldness scale is comprised of 21 items, 15 of which are original MPQ-Tri items, four of which are replacement items (one item was unable to be replaced as available replacements detracted from the scale), and two bolster items to further augment the scale's content validity. The final Meanness scale is comprised of 19 items, 14 of which are original MPQ-Tri items, two of which are replacement items, and three of which are bolster items. The final Disinhibition scale is comprised of 20 items, 16 of which are original MPQ-Tri items, two of which are replacement items, and two of which are bolster items. See Tables S3 to S5 for a complete list of scale items. Descriptive statistics for and reliability estimates (where applicable) for all scale scores in the Dunedin Study sample are displayed in Table S6.

Table S3

Items included in the final revised MPQ-Tri Boldness Scale by origin of item

Dunedin Number (Age 26)	MPQ 300 Number	Paraphrased Item	Original Scale Item Being Replaced (Item's Primary Trait Scale)
1*	1	Like to take charge when working with others	
9*	15r	Feelings are hurt rather easily	
14*	25	Like being in spotlight	
19*	33	An earthquake would be fun and exciting	
21*	35	Perform for an audience at any opportunity	
28*	47r	Prefer that others lead in most social situations	
41*	77	Would enjoy taking elevator to top of tall building under construction	
53*	105	Good at influencing others	
64*	124	Like to try challenging things	
79*	149	Would like crossing ocean in small sailboat	
113*	209	Exciting things happen daily	
119*	218r	Often dominate conversations	
141*	256	Life an adventure	
142*	257r	Dislike convincing others	
147*	274r	Like to be prepared for what to expect in new situations	
26**	44r	Would be embarrassed to tell others I had attended a nudist camp on vacation	MPQ-BF #60 (Stress Reaction) Recover quickly from embarrassment
67**	128	Would enjoy exploring old abandoned house	MPQ-BF #25 (Unlikely Virtues) Very courageous in difficult situations
91**	174	Take lead in decision making	MPQ-BF # 45 (Soc Potency) Not a follower
136**	244	Like to be influential business executive or politician	MPQ-BF #2 (Social Potency) Good at persuading others
No viable replacement[1]			MPQ-BF #29 (Stress Reaction) Am nervous
75***	142	Can manipulate others easily	

150***	278	Others turn to me to make decisions

Note. *Original MPQ-Tri scale item, **Replacement item, ***Bolster item. [1]Item was not administered in Dunedin Study to more than 9 people.

Table S4

Items included in the final revised MPQ-Tri Meanness Scale by origin of item

Dunedin Number (Age 26)	MPQ 300 Number	Paraphrased Item	Original Scale Item Being Replaced (Item's Primary Trait Scale)
18*	31r	When unhappy, (A) Prefer to be with friends (B) Prefer to be alone	
27*	45	Unwilling to "open up", even with friends	
34*	60r	Am a warm person	
37*	66	I have no problem stepping on others' toes if it benefits me	
48*	97	Sometimes enjoy physically harming others	
57*	112	Enjoy watching those I dislike embarrass themselves	
66*	127r	Try to forgive and forget when mistreated	
81*	152r	Enjoy being among good friends	
84*	158	Sometimes enjoy saying mean things	
90*	172	Enjoy brawling	
108*	202	Hit others if deserved	
121*	221	Am aloof and socially distant	
134*	232	Enjoy watching a violent fight	
153*	283	Others being friendly usually means they want something	
5**	7	Respond to criticism by pointing out weaknesses in critics	MPQ-BF #139 (Aggression) When insulted, try to get even
23**	37	Like violent films	MPQ-BF #127 (Aggression) Like to hit someone sometimes
100***	185	Enjoy frightening others	
112***	208r	Easily feel affection for someone	
137***	246	Sometimes cruelly tease others	

Note. *Original MPQ-Tri scale item, **Replacement item, ***Bolster item.

Table S5

Items included in the final revised MPQ-Tri Disinhibition Scale by origin of item

Dunedin Number (Age 26)	MPQ 300 Number	Paraphrased Items	Original Scale Item Being Replaced (Item's Primary Trait Scale)
13*	22	When hurt, try to get even	
15*	26r	Make decisions very carefully	
25*	41	Often act impulsively	
36*	64	Rather "play things by ear" than plan ahead	
43*	82	Frequently want to hit someone when angry	
46*	95	Have changing moods	
52*	104	Generally rushed and careless instead of slow and careful	
58*	115r	Rarely reckless	
68*	131	At times feel angry or anxious without knowing why	
78*	147	Mean things often said about me	
80*	151	Act impulsively	
95*	178	Others have knowingly said untrue things about me	
115*	212	Get too irritated over small setbacks	
128*	238	Often betrayed by friends	
132*	270	Sometimes tense all day	
160*	298	Some oppose me for no good reason	
72**	138r	Approach things sensibly and rationally	MPQ #90r[1] Tend to be levelheaded
93**	176	Often not cautious enough	MPQ-BF #140 (Control) Think carefully before deciding
2***	2r	Keep close track of finances	
120***	220r	Make decisions based on rules of right and wrong	

Note. *Original MPQ-Tri scale item, **Replacement item, ***Bolster item. [1]Listed in the Dunedin Study protocol as administered, however, only 9 subjects have data.

Table S6

Descriptive statistics for the revised MPQ-Tri scales in the Dunedin Study Samples, university sample, and prison sample

Measure	Mean	Min	Max	*SD*	Reliability	Skewness	Kurtosis
Dunedin Study sample							
Age 18							
Boldness	.42	.00	.94	.19		.33	-.49
Meanness	.30	.00	.88	.19		.62	-.06
Disinhibition	.38	.00	.95	.20		.31	-.55
Age 26							
Boldness	.47	.00	1.00	.20		.20	-.70
Meanness	.23	.00	1.00	.17		.95	.73
Disinhibition	.32	.00	.90	.18		.53	-.07
Undergraduate sample							
Boldness	.52	.05	.95	.20		-.21	-.65
Meanness	.36	.00	.89	.19		.30	-.68
Disinhibition	.46	.05	.95	.20		.11	-.62
Prison sample							
Boldness	.50	.05	.95	.20		-.15	-.48
Meanness	.35	.00	.84	.17		.50	.18
Disinhibition	.39	.00	.85	.21		.26	-.67

Construct Validity

Next, we provide additional information that was used to determine whether the original and revised MPQ-Tri scales were associated with the same nomological networks. For this purpose, we used an archival prison sample from Brislin et al. (2015) and an archival undergraduate sample from Brislin et al. (2017). (These samples were also used for the scale revision process described earlier). Details regarding the samples and associated findings not included in the main body of this article are provided below. Additional information regarding these samples and methods more broadly can be found in the original publications (see Brislin et al., 2015, and Brislin et al., 2017).

Results

Internal Consistency

Analyses of internal consistency (Cronbach's α) for each of the revised MPQ-Tri scales in the undergraduate sample, revealed .77 Boldness, .76 Meanness, and .76 Disinhibition. In the prison sample, internal consistencies were (α) .79 Boldness, .71 Meanness, and .81 Disinhibition.

Intercorrelations of MPQ-based Triarchic Scales

Correlations between the original MPQ-Tri scales, and the revised MPQ-Tri scales were calculated in both the undergraduate and prison samples to determine whether the associations between respective corresponding scales (i.e. original MPQ-Tri Boldness with revised MPQ-Tri Boldness) were sufficiently large to indicate that they assess the same theoretical construct. The results displayed in Table S7 show that large and significant correlations were observed between the original and revised MPQ-Tri Boldness, Meanness, and Disinhibition scales. We were also interested in whether correlations between non-corresponding original MPQ-Tri scales and revised MPQ-Tri scales demonstrated the expected pattern of associations (i.e. a significant association between Meanness and

Disinhibition, but not between Boldness and Meanness or Disinhibition). As shown in Table S7, as expected, there was evidence of moderate to large positive correlations of Meanness with Disinhibition across both samples, and small, non-significant associations of Boldness with Meanness and Disinhibition.

Similarly, intercorrelations among the revised MPQ-Tri scales were calculated in the both the undergraduate and prison samples to determine whether the pattern of associations was consistent of that expected among the triarchic psychopathy domains (i.e. a significant association between Meanness and Disinhibition, but not between Boldness and Meanness or Disinhibition). The results of these analyses displayed in Table S8 show that as expected, Meanness and Disinhibition were significantly associated with one another, however unexpectedly, a small positive correlation between Boldness and Disinhibition was observed in the undergraduate sample.

Table S7

Correlations of original MPQ-Based Triarchic Scales with revised MPQ-Tri Scales in the undergraduate and prison sample

	Revised MPQ-Tri Scale		
	Boldness	Meanness	Disinhibition
Undergraduate Sample			
Boldness (original)	**.93****	.05	.10
Meanness (original)	-.02	**.94****	**.45****
Disinhibition (original)	.02	**.44****	**.97****
Prison Sample			
Boldness (original)	**.93****	.12	.01
Meanness (original)	.05	**.95****	**.55****
Disinhibition (original)	-.0.6	**.57****	**.97****

Note. *$p < .05$; **$p < .01$; Bold represents hypothesized associations.

Table S8

Intercorrelations of revised MPQ-Based Triarchic Scales for both the undergraduate and prison samples

	Boldness	Meanness	Disinhibition
Undergraduate Sample			
Boldness	1	.10	.12*
Meanness	.10	1	**.42****
Disinhibition	.12*	**.42****	1
Prison Sample			
Boldness	1	.13	.02
Meanness	.13	1	**.55****
Disinhibition	.02	**.55****	1

Note. *$p < .05$; **$p < .01$. Bold represents hypothesized associations.

Correlations with External Criterion Measures

Correlations between the revised MPQ-Tri scales and external criterion measures were calculated in both the undergraduate and prison samples and are displayed in Tables S9 and S10 alongside respective corresponding correlations between the original MPQ-Tri scales and the external criterion measures derived from Brislin et al. (2015) and Brislin et al. (2017). These correlations were then used to calculate the Intraclass Correlation Coefficients reported in the main body of this paper to determine the level of agreement between the between the original MPQ-triarchic scales and the revised scales in their relative associations with various criterion measures.

Table S9

Undergraduate sample: Correlation analyses illustrating the association between triarchic domains and psychopathy-related variables for original and revised MPQ-Triarchic Scales

	Boldness		Meanness		Disinhibition	
	Revised MPQ-Tri	Original MPQ-Tri	Revised MPQ-Tri	Original MPQ-Tri	Revised MPQ-Tri	Original MPQ-Tri
CPI Socialization Scale	-.12	-.03	-.43	-.44	-.51	-.51
Narcissistic Personality Inventory (NPI)						
Total Score	.72	.69	.11	.08	.13	.11
Authority	.68	.69	-.01	-.02	.04	.03
Exhibitionism	.56	.51	.06	.03	.26	.24
Superiority	.40	.40	-.07	-.09	-.09	-.10
Entitlement	.36	.30	.32	.30	.26	.27
Exploitativeness	.49	.45	.25	.21	.17	.16
Self-Sufficiency	.43	.45	-.04	-.06	-.09	-.11
Vanity	.26	.23	.04	.04	.01	.01
Sensation Seeking Scale (SSS)						
Total Score	.45	.38	.27	.25	.34	.31
Thrill and adventure seeking	.44	.42	.50	.01	.10	.07
Experience seeking	.25	.23	.03	.05	.13	.11
Boredom susceptibility	.21	.14	.36	.37	.36	.36
Disinhibition	.27	.20	.30	.28	.33	.31
Emotional Empathy Scale (EES)	-.18	-.18	-.39	-.36	-.15	-.13
Fear Survey Schedule-III (FSS-III)						
Total score	-.25	-.28	-.10	-.05	.08	.09
Social Phobia	-.28	-.34	.03	.07	.13	.14
Agoraphobia	-.20	-.22	-.03	.01	.07	.07
Blood/Injury/Injection	-.16	-.17	-.14	-.11	.08	.09
Aggression/Sex	-.10	-.09	-.11	-.09	-.08	-.08
Animal Phobia	-.18	-.18	-.16	-.11	.04	.03
Taylor Manifest Anxiety Scale (TMAS)	-.30	-.37	.16	.19	.39	.42
EASI Temperament Inventory						
Emotionality						
Fearfulness	-.33	-.38	-.13	-.08	.15	.17
Anger	.12	.04	.35	.39	.49	.50
Distress	-.27	-.33	-.03	.00	.29	.30
Sociability	.28	.33	-.24	-.28	-.03	-.15
Activity	.37	.37	-.09	-.10	.08	.07
Impulsivity	.23	.18	.22	.21	.56	.53
Questionnaire Upon Mental Imagery (QUMI)	-.20	.21	.14	-.14	.12	-.11

Table S10

Prison sample: Correlation analyses illustrating the association between triarchic domains and psychopathy-related criterion measures, and psychopathy-related variables for original and revised MPQ-Triarchic Scales

	Boldness		Meanness		Disinhibition	
	Revised MPQ-Tri	Original MPQ-Tri	Revised MPQ-Tri	Original MPQ-Tri	Revised MPQ-Tri	Original MPQ-Tri
Psychopathy Checklist Revised (PCL-R)						
Total score	.16	.12	.33	.35	.27	.28
PCL-R Factor 1	.25	.23	.22	.22	.08	.09
Interpersonal Facet	.31	.33	.11	.10	.02	.05
Affective Facet	.13	.09	.28	.30	.13	.14
PCL-R Factor 2	.06	.03	.36	.38	.36	.38
Impulsive-Irresponsible Facet	.11	.08	.30	.32	.41	.41
Antisocial Facet	-.03	-.02	.32	.35	.23	.24
DSM-IV Antisocial Personality Disorder (ASPD)						
Total symptoms	.09	.10	.16	.40	.27	.29
Child Conduct Disorder Symptoms	.18	.17	.21	.36	.27	.21
Adult Antisocial Behavior Symptoms	.03	-.03	.12	.34	.23	.31
Aggressive acts coded from interview/files						
Number of fights (childhood)	.03	.07	.25	.31	.13	.19
Number of fights (adulthood)	.06	.12	.27	.38	.16	.21
Number of violent charges	.02	-.06	-.00	.18	-.04	.11
Substance use problems						
Alcohol Dependence Scale	-.05	-.13	.28	.29	.36	.38
Short Drug Abuse Screening Test	.03	.02	.19	.24	.28	.32
CPI Socialization Scale	.05	.11	-.52	-.50	-.56	-.58
Narcissistic Personality Inventory (NPI)						
Total Score	.70	.71	.14	.17	.02	.03
Authority	.63	.66	-.02	.03	-.09	-.08
Superiority	.44	.51	-.09	-.04	-.14	-.17
Vanity	.47	.49	.01	.02	-.30	-.26
Self-Sufficiency	.25	.30	.03	.01	-.08	-.07
Entitlement	.37	.32	.30	.31	.06	.10
Exploitativeness	.34	.22	.29	.29	.29	.30
Exhibitionism	.60	.60	.19	.20	.29	.25
Sensation Seeking Scale (SSS)						
Total Score	.43	.39	.12	.10	.18	.17
Thrill and adventure seeking	.42	.43	-.10	-.11	-.08	-.07
Experience seeking	.38	.35	-.01	-.03	.03	.02
Boredom susceptibility	.25	.23	.31	.31	.35	.33
Disinhibition	.34	.32	.34	.32	.35	.34

NEO-Five Factor Inventory (NEO-FFI)						
Neuroticism	-.31	-.40	.33	.33	.56	.60
Extraversion	.53	.60	-.22	-.26	-.23	-.27
Openness	.36	.34	-.23	-.25	-.21	-.24
Agreeableness	-.11	-.06	-.52	-.54	-.49	-.51
Contentiousness	.21	.26	-.17	-.18	-.44	-.46
EASI Temperament Inventory						
Emotionality						
Fearfulness	-.41	-.44	.06	.12	.31	.35
Anger	.03	-.31	.40	.26	.34	.53
Distress	-.21	-.02	.25	.41	.48	.39
Sociability	.17	.38	-.23	.07	-.13	.11
Activity	.35	.21	.09	-.26	.12	-.13
Impulsivity	.21	.13	.29	.29	.45	.43
Positive and Negative Affect Schedule (PANAS)						
Positive Affect	.55	.45	-.08	-.29	-.39	-.43
Negative Affect	-.14	-.34	.18	.26	.30	.49
Beck Depression Inventory (BDI)	-.22	-.29	.31	.30	.38	.44
Fear Survey Schedule-III (FSS-III)	-.19	-.22	.16	.21	.20	.24
State-Trait Anger Expression Inventory (STAXI)						
Total Score	-.07	-.13	.52	.53	.55	.57
Anger In	-.22	-.32	.41	.42	.46	.48
Anger Out	.12	.11	.40	.39	.39	.38
Control	.07	.08	.33	-.36	-.37	-.40
Shipley Institute of Living Scale (SIL)						
Total Score	.33	.31	-.07	-.14	-.11	-.18
Verbal	.34	.29	-.16	-.16	-.18	-.19
Abstraction	.28	.24	-.01	-.04	-.05	-.06

Factor Analyses

In accordance with Somma et al.'s (2019) recommendations for factor analyses of triarchic scales, an exploratory (ESEM) bi-factor analysis was conducted for each of the revised MPQ-Tri scales at age 26 of the Dunedin Study sample using Mplus Version 8.7 (Muthén & Muthén, 1998–2017). These analyses were not conducted using age 18 Dunedin Study data as several MPQ-Tri scale items were not administered to a sufficient number of participants at this timepoint. Because MPQ items are binary, we used the mean- and variance-adjusted weighted least squares estimator for categorical data. For the general factor and orthogonal group factor solution, the default bi-geomin rotation method was employed. We interpreted loadings of |.30| or larger as meaningful. For each MPQ-Tri scale, the bi-factor model was comprised of the general factor which represented the triarchic construct being assessed (i.e. Boldness, Meanness, or Disinhibition) and on which all items loaded, as well as any additional residual group factors indicated by the model. Because WLSMV estimator does not allow for parallel analysis, goodness-of-fit indices were used to identify the *minimum* number of factors that reached acceptable model fit. Specifically, root mean square error of approximation (RMSEA) no greater than .08, Tucker-Lewis and comparative fit indices (TLI, CFI) greater than .90 or ideally .95, and Standardized Root Mean Squared Residual (SRMR) no greater than .08 were interpreted as indicative of adequate model fit. Theory was a guiding method in determining the optimal factor structure. Bi-geomin rotated factor loadings were examined to interpret the bi-factor model factor structure. A priori expectations held by the authors were that the factor structure of the revised MPQ-Tri scales would resemble the natural structure of the MPQ. This further guided decision making regarding the optimal factor structure. Each model were also compared to a standard one-factor CFA model (WLSMV estimation) with the expectation that the latter would be an inferior representation of the triarchic domain scale structure.

Table S11

Factor Analysis of Revised MPQ-Tri Items for the Boldness, Meanness, and Disinhibition Scales: Goodness-of-Fit Indices

	Boldness	Meanness	Disinhibition
CFA			
RMSEA	.074	.067	.086
CFI	.798	.825	.707
TLI	.776	.804	.672
SRMR	.100	.116	.135
Bi-Factor EFA: One general factor, one group factor			
RMSEA	.052	.043	.050
CFI	.910	.936	.913
TLI	.888	.918	.890
SRMR	.072	.078	.083
Bi-Factor EFA: One general factor, two group factors			
RMSEA	.046	.028	.031
CFI	.940	.976	.969
TLI	.915	.965	.956
SRMR	.061	.056	.055

On the balance of fit indices and theoretical guidance, the findings supported a 3-factor (one general, two group factors) model for the Boldness, Meanness and Disinhibition scales (see Table S11). For Boldness, the vast majority of items loaded onto the general factor with a factor loading of above .30. As expected, the group factors appeared to resemble the relevant MPQ subscales. The first group factor was comprised entirely of Harm Avoidance items, and the second group factor comprised mostly of items from the Social Potency subscale. Although TLI and CFI were slightly lower than would be optimal (CFI .940, TLI .915) being below .95 for Boldness, the three-factor structure was selected as optimal given consistency with research suggesting that underlying dimensions of

fearlessness and sociability/leadership associated with the boldness construct (Shou et al., 2018). With respect to Meanness, almost all items for each of the three scales loaded onto the general factor with a factor loading of above .30. In addition, all fit indices reached the desired thresholds for a 3-factor model. Consistent with expectations, items with significant factor loadings on the first and second group factors were exclusively from the Social Closeness and Aggression scales, respectively. Finally, the 3-factor model for Disinhibition showed good model fit across all four fit indices. All items but one loaded onto the general factor with a factor loading of above .30. The first group factor was comprised of items primarily from the Stress Reaction scale, whereas the second group factor contained items exclusively from the Alienation scale. Unsurprisingly, the bi-factor model for all three MPQ-Tri scales showed better relative model fit when compared with the single-factor (CFA) model for that scale, the latter of which all had unacceptable fit (see Table S11). Bi-geomin rotated factors loadings for the best-fitting ESEM model of each MPQ-Tri scale are displayed in Tables S12, S13, and S14.

The factor analyses performed as part of the current investigation further elucidate the factor structure of the MPQ-Tri. In essence, they indicate that the general structure of each of the three triarchic scales is upheld when the natural structure of the MPQ is controlled for. While these findings provide promising evidence to support the MPQ-Tri, future research is needed replicate these findings, and to determine whether those items that perform worse should be considered for removal in order to improve the MPQ-Tri scales.

Table S12

Exploratory Structural Equation Model of Revised MPQ-Tri Items for the Boldness Scale: Bi-Geomin Rotated Factor Loading Matrices

MPQ-Tri Boldness Item	B	F1	F2
1	**.692***	-.122	.030
15r	.272*	-.253*	-.071
25	**.676***	.019	**.426***
33	**.393***	**.517***	.089
35	**.679***	.134	**.391***
47r	**.596***	-.075	**.338***
77	**.385***	**.623***	-.091
105	**.739***	-.165	-.098
124	**.528***	.126	-.258*
149	**.409***	**.424***	-.174*
209	**.447***	.033	**-.350***
218r	**.517***	.180*	**.405***
256	**.437***	.027	**-.412***
257r	**.513***	-.051	.115
274r	.199*	**.352***	.097
44r	.242*	.240*	.065
128	**.342***	**.598***	.008
174	**.624***	-.283*	.043
244	**.631***	-.031	.056
142	**.605***	-.185*	-.005
278	**.575***	**-.302***	-.228*

Note. All items are identified by their MPQ300 numbers. *Significant at 5% level. All rotated factor loadings above .3 are in bold. Model fit indices are as follows: RMSEA .046, CFI .940,

TLI .915, SRMR: .061. B represents the general Boldness factor; F1 represents the first group factor; F2 represents the second group factor.

Table S13

Exploratory Structural Equation Model of Revised MPQ-Tri Items for the Meanness Scale: Bi-Geomin Rotated Factor Loading Matrices

MPQ-Tri Meanness Item	M	F1	F2
31r	.200*	**.581***	-.113
45	**.373***	**.641***	-.091
60r	.295*	**.606***	.235*
66	**.467***	.080	**.431***
97	**.849***	-.144	.019
112	**.490***	-.104	**.347***
127r	**.560***	-.027	.292*
152r	**.339***	**.516***	.041
158	**.531***	-.047	**.509***
172	**.900***	-.133	-.098
202	**.749***	-.250*	-.036
221	**.329***	**.593***	.026
232	**.880***	.008	-.132
283	**.389***	**.258***	-.033
7	**.468***	.051	**.395***
37	**.706***	.024	-.178
185	**.545***	-.088	.232*
208r	.288*	**.499***	-.005
246	**.466***	.021	**.522***

Note. All items are identified by their MPQ300 numbers. *Significant at 5% level. All rotated factor loadings above .3 are in bold. Model fit indices are as follows: RMSEA .028, CFI .976,

TLI .965, SRMR: .056. M represents the general Meanness factor; F1 represents the first group factor; F2 represents the second group factor.

Table S14

Exploratory Structural Equation Model of Revised MPQ-Tri Items for the Disinhibition Scale: Bi-Geomin Rotated Factor Loading Matrices

MPQ-Tri Disinhibition Item	D	F1	F2
22	**.395***	.056	.218*
26r	**.661***	-.084	-.090
41	**.700***	-.005	.019
64	**.512***	**-.328***	-.047
82	**.467***	**.423***	.054
95	**.359***	**.689***	-.064
104	**.601***	-.103	-.103
115r	**.522***	-.201	.021
131	**.409***	**.619***	-.021
147	**.472***	-.021	**.781***
151	**.729***	-.246	-.010
178	.258*	-.022	**.669***
212	**.310***	**.532***	.032
238	**.423***	.133*	**.636***
270	**.430***	**.598***	.055
298	**.456***	.020	**.686***
138r	**.667***	-.116	-.253*
176	**.712***	-.150	.057
2r	**.406***	.008	-.181*
220r	**.421***	.084	-.188*

Note. All items are identified by their MPQ300 numbers. *Significant at 5% level. All rotated factor loadings above .3 are in bold. Model fit indices are as follows: RMSEA .031, CFI .969, TLI .956, SRMR: .055. D represents the general Disinhibition factor; F1 represents the first group factor; F2 represents the second group factor.

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