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Diving into the Abyss: Dark Personality Facets, Mating Behavior, and Methodological Issues

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Abstract

Facets of dark personality traits are rarely used as predictors for relevant outcomes, although analysis on a facet level enhances differentiated interpretation of associations. Furthermore, previous research on the associations of dark personality and mating behavior is incoherent, the factorial structure of dark personality is still controversial and measurement invariance of questionnaires has not been thoroughly examined. The present study gives insights into the associations of dark personality and mating behavior, clarifies the factorial structure of dark personality using different statistical approaches and investigates the measurement invariance of German adaptations of well-established self-report questionnaires (Narcissistic Personality Inventory, Self-Report Psychopathy Scale and trimmed MACH). 749 participants (54% women, mean age = 34.28 years) filled out the present study's survey in a cross-sectional design including multiple scales measuring dark personality traits and mating behavior. Additionally, attractiveness of dark personality traits was investigated using facial and verbal attractiveness ratings. Confirmatory factor analysis and exploratory structural equation modelling suggested a three-factor model of dark personality. Residual invariance was shown for subgroups with different educational statuses and configural invariance was shown for gender groups. Dark personality facets were differentially related to infidelity and jealousy among men and women. Facets of secondary psychopathy and overt narcissism were important predictors in both sexes for all outcome variables, whereas covert narcissism showed significant associations with jealousy and intention towards infidelity only among men. Facial attractiveness ratings indicated similar attractiveness of high and low Dark Triad faces, whereas verbal attractiveness ratings indicated higher attractiveness of low Dark Triad description.

Keywords: Dark Triad, Narcissism, Machiavellianism, Psychopathy, Infidelity, Jealousy, Attractiveness, Confirmatory factor analysis, Exploratory structural equation modelling, Measurement invariance.

Diving into the Abyss: Dark Personality Facets, Mating Behavior, and Methodological Issues

17 years ago, Paulhus and Williams (2002) introduced the term *Dark Triad*, which includes the three personality traits narcissism, Machiavellianism and psychopathy. Since then, an increasing number of publications explored the associations of these distinct but substantially overlapping traits with relevant outcomes like occupational, educational, mating, interpersonal, and antisocial behavior in non-clinical as well as clinical populations (Furnham, Richards, & Paulhus, 2013). Meta-analysis showed associations of the Dark Triad with meaningful psychosocial correlates like erratic behavior, antisocial tactics, interpersonal difficulties and aggression (Muris, Merckelbach, Otgaar, & Meijer, 2017). However, most research in this field focused on higher-order factors (e.g., psychopathy) as statistical predictors for psychosocial correlates without examining the predictive power of separable lower-order factors (e.g., antisocial and impulsive thrill-seeking facets of psychopathy), although analysis on a facet level has been shown to improve the prediction of relevant outcomes (Darr & Kelloway, 2016; Feldt, Lee, & Dew, 2014). Furthermore, some facets like covert forms of narcissism (e.g., hypersensitive narcissism) have been examined only sparsely (Furnham et al., 2013) and associations of dark personality traits with outcomes like infidelity, jealousy and attractiveness ratings were inconsistent across studies and need additional clarification (e.g., Brewer, Hunt, James, & Abell, 2015; Jones & Weiser, 2014). Moreover, the factorial structure of dark personality traits needs further investigation (Furnham et al., 2013) and measurement invariance of some scales has not been examined. In addition, researchers are facing several methodological challenges, like multicollinearity in multiple regression, when examining dark personality traits, which can lead to invalid interpretations if not taken into account (Furnham, Richards, Rangel, & Jones, 2014). I propose approaches to overcome some of the methodological challenges, aim to deepen insights into the associations of dark personality facets, infidelity, jealousy and attractiveness in a non-clinical population, investigate the factorial structure of dark personality traits and examine measurement invariance of Dark Triad questionnaires.

The Dark Triad

Research about narcissism, Machiavellianism and psychopathy dates back long before the introduction of the term Dark Triad in 2002. The constructs of narcissism and psychopathy originated from clinical research (Hare & Neumann, 2008; Yakeley, 2018), whereas the term

Machiavellianism was introduced into mainstream psychology by social psychologists Richard Christie and Florence Geis in 1970 (Christie & Geis, 1970).

The term narcissism is based on the Greek mythological figure of Narcissus. In psychology, the term was first used by Havelock Ellis (1898) and is now referred to as the “pursuit of gratification from vanity or egotistic admiration of one’s own attributes” (Muris et al., 2017, p. 184). The examination of subclinical narcissism became increasingly popular with the publication of the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979), which measures seven dimensions using 40 items in a forced choice format (Muris et al., 2017). A short version (NPI-16; Ames, Rose, & Anderson, 2006) and a German version (NPI-15; Spangenberg et al., 2013) are available. Using exploratory factor analysis (EFA), Spangenberg et al. (2013) proposed a two-factor structure of the NPI-15, including a leadership personality and grandiosity facet. Leadership personality describes being in the center of attention, exerting influence on people and taking the leading role. Grandiosity refers to the feeling that one is unique, important and extraordinary. These facets are summarized as overt forms of narcissism (Hendin & Cheek, 1997). The covert forms of narcissism, which manifest themselves in symptoms of vulnerability and hypersensitivity, are often overlooked in Dark Triad research (Furnham et al., 2013). Covert forms of narcissism include a fragile self-structure, being more easily hurt and being dependent on the confirmation of others (Besser & Priel, 2009). One example of a covert narcissism measurement instrument is the Hypersensitive Narcissism Scale (Hendin & Cheek, 1997). Fossati et al. (2009) proposed a two-factor model of hypersensitive narcissism in clinical and non-clinical populations featuring an oversensitivity to judgment and egocentrism facet.

The construct of psychopathy originated in psychiatry and is “a personal trait characterized by enduring antisocial behavior, diminished empathy and remorse, and disinhibited or bold behavior” (Muris et al., 2017, p. 184). Hare, a renowned expert in research on psychopathy, developed the observer rating scale Psychopathy Check List-Revised (PCL-R, Hare, 1991), which has been the most widely used standard measure of clinical psychopathy for decades (Hare & Neumann, 2008). Hare and Neumann (2008) proposed a hierarchical dimensional structure of psychopathy with two higher-order factors (primary and secondary psychopathy) and four lower-order factors (interpersonal, cold affect, impulsive thrill-seeking and antisocial facet). Primary psychopathy features manipulative and exploiting behavior for selfish purposes (interpersonal facet), callousness and the lack of remorse, guilt and empathy

(cold affect facet). Secondary psychopathy features sensation-seeking, impulsive and irresponsible behavior (impulsive thrill-seeking facet) and preference for rule breaking, being prone to violence, drug use and other criminal behavior (antisocial facet) (Hare & Neumann, 2008). Hare also introduced the Self-Report Psychopathy scale (SRP; Hare, 1985), which measures the same dimensions as the PCL-R and is one of the most important self-report questionnaires for the assessment of psychopathy in non-clinical populations (Muris et al., 2017).

The construct of Machiavellianism is named after the Italian political theorist Niccoló Machiavelli. In psychology, Machiavellianism is defined as “a duplicitous interpersonal style, a cynical disregard for morality, and a focus on self-interest and personal gain” (Muris et al., 2017, p. 184). The introduction of Machiavellianism into personality psychology goes back to the development of the MACH by Christie and Geis (1970). The fourth version of the MACH (MACH-IV; Christie & Geis, 1970) contains 20 items and is one of the most widely used self-report questionnaires for the assessment of Machiavellianism (Muris et al., 2017). Recently, the MACH-IV was investigated with item response theory (IRT) and five items with the strongest measurement precision were proposed as the trimmed MACH (MACH*; Rauthmann, 2013).

Dark Triad and Mating Behavior

Across studies and questionnaires, men have scored significantly higher than women in dark personality traits and these sex differences were often found to moderate associations with interpersonal relations (Furnham et al., 2013). Researchers have argued that sex differences in dark personality traits account for different mating strategies in men and women (Jonason, Li, Webster, & Schmitt, 2009) and embed these findings into the framework of the Life History Theory (LHT) (McDonald, Donnellan, & Navarrete, 2012; Smith, Øverup, & Webster, 2019). According to the LHT (Figueredo, Cabeza de Baca, & Woodley, 2013; Rushton, 1985), individuals differ in reproductive strategies. Those who emphasize mating have a fast life strategy and those emphasizing parenting have a slow life strategy (Furnham et al., 2013). The fast life strategy features aggressiveness, deviance, selfishness and pursuit of short-term gains (Jonason & Kavanagh, 2010). Because sensation-seeking, impulsive and irresponsible behavior are an essential part of secondary psychopathy, individuals with high manifestations in this dimension should be prone to a fast life strategy (McDonald et al., 2012). Especially psychopathy, but also overt narcissism and Machiavellianism showed positive relations to the preference of short-term mating (Jonason, Li, Webster, & Schmitt, 2009). This association was

found to be stronger in men than women. Furthermore, dark personality traits are associated with exploitative mating strategies. Especially secondary psychopathy and overt narcissism were found to be associated with infidelity experiences and the intention towards infidelity in women (Brewer et al., 2015). In a Malaysian population, Alavi, Kye Mei, and Mehrinezhad (2018) found associations between intention towards infidelity, psychopathy and Machiavellianism but not narcissism. Non-single users of the dating platform Tinder scored significantly higher on psychopathy compared to non-users in a committed relationship (Timmermans, De Caluwé, & Alexopoulos, 2018). Research indicates sex differences in the associations of dark personality traits and infidelity: psychopathy and Machiavellianism predicted infidelity among women and only psychopathy predicted infidelity among men (Jones & Weiser, 2014).

Most of the studies described above used global measures of the Dark Triad (Alavi et al., 2018; Timmermans et al., 2018), which cannot differentiate between lower-order factors or examined only specific populations (e.g., women; Brewer et al., 2015). Especially the associations of covert narcissism, intentions towards infidelity and infidelity experience have not been examined. Furthermore, the results are inconsistent across studies: psychopathy seems to be a solid predictor of infidelity among men and women, whereas the roles of narcissism and Machiavellianism are less clear. In addition, Brewer et al. (2015) did not report investigating the dimensionality of their Infidelity Experience Scale, which would have been a necessity to compute a composite score (Slocum-Gori & Zumbo, 2011). Confirmatory factor analysis (CFA) or specific IRT models are recommended to assess the unidimensionality of questionnaires (Ziegler & Hagemann, 2015).

Research indicates that exploitative mating strategies, which were found to be associated with dark personality traits, are manifested in relationships through *ludus* – a game-playing, distant love style and *pragma* – a pragmatic love style (Jonason & Kavanagh, 2010). The *ludus* love style was found to be associated with the strategic induction of jealousy towards a partner (Goodboy, Horan, & Booth-Butterfield, 2012). Therefore, it is not surprising that the Dark Triad also showed associations with the induction of jealousy (Jonason, Li, & Buss, 2010). Vulnerable and grandiose narcissism were found to be related to strategic jealousy-induction to acquire power and control (Tortoriello, Hart, Richardson, & Tullett, 2017). Primary psychopathy showed associations with jealousy-induction to gain control over a partner or to exact revenge and secondary psychopathy was associated with jealousy-induction to test the relationship, gain

control over a partner or to gain self-esteem (Massar, Winters, Lenz, & Jonason, 2017). Interestingly, research about associations of Machiavellianism, which is defined by a manipulative interpersonal style, and jealousy-induction either found no (Jonason et al., 2010) or weak associations (Brewer et al., 2015). Individuals with high manifestations in dark personality traits do not only tend to induce jealousy, but are also experiencing more jealousy themselves. Overt narcissism and Machiavellianism were found to be associated with anxious, as well as preventive jealousy (Barelds, Dijkstra, Groothof, & Pastoor, 2017). Primary and secondary psychopathy showed associations with emotional jealousy (Massar et al., 2017). Machiavellianism and psychopathy were found to be associated with cognitive and behavioral jealousy and overt narcissism was additionally associated with emotional jealousy (Chin, Atkinson, Raheb, Harris, & Vernon, 2017). The sex of participants showed links to experienced jealousy (Burchell & Ward, 2011) and should therefore be taken into account when examining relations of dark personality traits and jealousy.

Most research either only examined one or two of the Dark Triad traits simultaneously (Massar et al., 2017; Tortoriello et al., 2017) or used a global Dark Triad measure (Barelds et al., 2017; Chin et al., 2017) which cannot differentiate between lower-order factors. Furthermore, the role of covert narcissism in the experience of jealousy has not been examined. In contrast to overt forms of narcissism, covert forms are related to attachment anxiety (Brewer et al., 2018; Besser & Priel, 2009). Attachment anxiety is related to higher levels of jealousy in comparison to attachment avoidance (Buunk, 1997) and attachment avoidance is primarily related to Machiavellianism and psychopathy (Brewer et al., 2018). Therefore, covert narcissism should be a stronger predictor of jealousy than Machiavellianism and psychopathy. To determine which dark personality trait is the strongest predictor of jealousy and jealousy-induction on a facet level, research including lower-order factors of the Dark Triad in multivariate analysis is needed.

The huge commercial success of the erotic romance novel *Fifty Shades of Grey* introduced in 2011, which is notable for its erotic scenes featuring elements of sexual practices involving sadism, masochism, dominance and submission (Bonomi, Altenburger, & Walton, 2013), indicates that dark personality traits have some kind of attraction in the general public. Most research investigating the attractiveness of dark personality traits focused on women and included either verbal descriptions or facial attractiveness ratings (Brewer, Carter, Lyons, & Green, 2018; Carter, Campbell, & Muncer, 2014; Jonason, Lyons, & Blanchard, 2015; Lyons &

Simeonov, 2016; Lyons, Marcinkowska, Helle, & McGrath, 2015; Marcinkowska, Helle, & Lyons, 2015; Qureshi, Harris, & Atkinson, 2016). Verbal descriptions of men with high manifestations in the Dark Triad were rated more attractive by women than descriptions of men with low manifestations (Carter et al., 2014). Qureshi et al. (2016) could not replicate these findings. However, Carter et al. (2014) used verbal descriptions which included a combination of all Dark Triad traits, whereas Qureshi et al. (2016) used descriptions which included only one dark personality trait separately. Both sexes preferred partners low in Dark Triad traits for long-term relationships, whereas those with high Dark Triad traits were preferred for one-night stands when using verbal descriptions (Jonason et al., 2015). Women high in psychopathy considered Dark Triad traits in potential male partners more attractive (Jonason et al., 2015). In a speed dating study, manifestations of psychopathy in women were positively associated with the preference for short-term relationships in general (Jauk et al., 2016). Narcissism, Machiavellianism and psychopathy were found to be positively associated with preferences for short-term relationships, whereas Machiavellianism and psychopathy were also negatively correlated with preferences for serious romantic relationships (Koladich & Atkinson, 2016). This is in line with the associations of Machiavellianism, psychopathy and attachment avoidance pointed out earlier (Brewer et al., 2018). Research indicates that facial structure is a valid cue of dark personality traits and that these traits might be manifested in physical-morphological characteristics (Holtzmann, 2011). When investigating the facial attractiveness of male faces which represent high or low manifestations in the Dark Triad, women were found to be generally averse to faces with high levels of narcissism, Machiavellianism and psychopathy for both short- and long-term relationships (Brewer et al., 2018; Lyons & Simeonov, 2016; Lyons et al., 2015).

Research findings concerning the attractiveness of Dark Triad traits are inconclusive. Depending on the stimulus material, research showed contradictory results: when facial attractiveness ratings were used, high Dark Triad manifestations were rated mostly less attractive for short-term and long-term relationships; when verbal descriptions were used, interest in short-term relationship was higher and interest in long-term relationships was lower for high Dark Triad descriptions. No study so far has investigated the attractiveness of both men and women with different manifestations in dark personality traits using verbal descriptions and facial attractiveness ratings in one research design.

Methodological Issues in Dark Triad Research

When examining dark personality traits, researchers have to deal with several methodological challenges like the debatable factorial structure of dark personality (Furnham et al., 2013), multicollinearity in multiple regression (Sleep, Lynam, Hyatt, & Miller, 2017), skewed distributions (e.g., Egan, Hughes, & Palmer, 2015; Preotiuc-Pietro, Carpenter, Giorgi, & Ungar, 2016), and measurement invariance (Chiorri, Garofalo, & Velotti, 2019), which may lead to invalid interpretation if not taken into account.

Factorial structure of dark personality traits. The fact that Dark Triad traits have been found to consistently share a considerable amount of variance over studies, populations and questionnaires used, led researchers to assume a common core of dark personality traits (Furnham et al., 2013). Meta-analysis showed average effect sizes ranging from $r = .34 - .58$ for the intercorrelations among Dark Triad traits (Muris et al., 2017). Callousness and agreeableness were discussed as the reason for the overlap of the constructs (Furnham et al., 2013). Depending on the questionnaires used, evidence from structural equation modelling (SEM) suggested a one-factor model (*Dark Core*; Bertl, Pietschnig, Tran, Stieger, & Voracek, 2017), a three-factor model (Dark Triad, Jonason & Webster, 2010) or a combination of both in a bifactor model (Volmer, Koch, & Wolff, 2019). However, some of the studies which investigated the dimensional structure of the Dark Triad used item parcels as a basic unit for SEM (Bertl et al., 2017; Volmer et al., 2019) or non-robust estimators which might be biased (Jonason & Webster, 2010). Simulation studies showed, that certain types of item parceling can mask a multidimensional factor structure, in a way that acceptable fit indices are found for a wrongly specified solution (Bandalos, 2009). When using parceling for psychometric and modeling-related benefits, unidimensionality of items in a parcel is an important prerequisite (Matsunaga, 2008). To determine if unidimensionality of subscales is given and to evaluate the factorial structure of psychological constructs in general, a confirmatory framework using CFA is recommended (Boateng, Neilands, Frongillo, Melgar-Quinonez, & Young, 2018; Ziegler & Hagemann, 2015).

However, CFA in SEM framework have a strict requirement of zero cross-loadings. The specification of non-zero cross-loadings as zero can lead to over-estimated factor correlations and therefore to distorted structural relations (Asparouhov & Muthén, 2009). Especially in research fields where substantial cross-loadings are expected due to significant intercorrelations of constructs (e.g., in Dark Triad research), exploratory structural equation modelling (ESEM) can

help clarify the factorial structure of constructs by allowing cross-loadings while giving access to the usual SEM parameters. Rogoza and Cieciuch (2018) have conducted ESEM analysis to investigate the factorial structure of dark personality traits. They assumed a hierarchical structure of dark personality traits with two higher-order factors (narcissism and psychopathy-Machiavellianism) and 12 lower-order factors. However, a three-factor model representing the Dark Triad did not converge in their analysis and they did not report factor loadings of ESEM with items as a basic unit. Until today, the dimensional structure of the Dark Triad is unclear and to my knowledge, no study so far has investigated the factorial structure of dark personality traits using SEM and ESEM with robust estimators and items as a basic unit.

Multicollinearity. When using dark personality traits as independent variables in multivariate analysis, researchers have often dealt with the shared variance of the overlapping constructs by conducting simultaneous ordinary least square (OLS) regression or by computing a single composite score (Furnham et al., 2014). Although OLS regression is certainly an appropriate way to determine predictors which have a unique effect on the dependent variable under consideration of the shared variance, high intercorrelations of independent variables can lead to problems in the interpretation of regression coefficients nevertheless. The influence of multicollinearity on the validity of parameter estimates in OLS regression is well documented (Chen, 2012; Farrar & Glauber, 1967; Murphy & Guilkey, 1975; Zhang & Ibrahim, 2005). Strong relations of independent variables can lead to parameter estimates that are sensitive to changes in model specification, are therefore unstable and can lead to biased interpretation (Farrar & Glauber, 1967). To reduce the problem of multicollinearity in regression analysis, some authors recommended ridge regression, which adds a small squared bias factor, called shrinkage ridge parameter, in the minimization function (Duzan & Shariff, 2015). Ridge regression performed better than OLS regression under the assumption of multicollinearity when using mean squared error (MSE) as a performance measure in many cases (Duzan & Shariff, 2015) but not all (Zhang & Ibrahim, 2005). Other researchers recommended partial least squares (PLS) regression (Chong & Jun, 2005) or Bayesian approaches (Curtis & Ghosh, 2011) to cope with the problem of multicollinearity. Other general approaches are the conduction of principal component analysis (PCA) for dimension reduction or the exclusion of redundant predictors (Field, 2013). The latter are not applicable in the case of the Dark Triad, because narcissism, Machiavellianism and psychopathy are neither redundant nor should they be reduced to even

fewer factors. There is no definite solution for multicollinearity in multiple regression: researchers should evaluate the stability of their regression coefficients by changing their model specifications, comparing the direction and magnitude of the regression coefficients with correlation coefficients, using standard indicators for multicollinearity like variance inflation factors (VIF) (Field, 2013) and conducting robust regression methods like ridge regression to secure results.

Other researches tried to bypass the problem of multicollinearity by computing a composite score including all Dark Triad traits (Furnham et al., 2014). The constructs of the Dark Triad share variance (Muris et al., 2017), but are by definition distinct. Machiavellianism is defined by strategic decision making and intact impulse control, whereas secondary psychopathy is defined by erratic, impulsive behavior (Furnham et al., 2013). While there might be a common core of dark personality, a combination of all variables in one composite score is problematic because of the distinctive differences and contrary definitions of the constructs (Furnham et al., 2013). Computation of single index values including multiple constructs can lead to biased interpretations because a single composite score cannot account for multiple constructs and should therefore be avoided.

Skewed distributions and appropriate estimators. Dark personality traits are often measured with self-report questionnaire like the Self-Report-Psychopathy Scale (SRP-III; Küfner, Dufner, & Back, 2014), Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979) and the MACH (MACH-IV; Christie & Geis, 1970). When evaluating the psychometric quality of questionnaires, researches have to deal with skewed distributions and floor effects on an item level (e.g., Egan et al., 2015; Preotiuc-Pietro et al., 2016). However, researchers have often used estimators like Cronbach's coefficient α for reliability (e.g., Chin et al., 2017; Jones & Weiser, 2014; Lyons & Simeonov, 2016; Massar et al., 2017; Spangenberg et al., 2013; Veselka, Giammarco, & Vernon, 2014) or non-robust Maximum Likelihood (ML) estimators in CFA (e.g., Jonason & Webster, 2010), which have been shown to be biased under non-normal distributions (Gadermann, Guhn, & Zumbo, 2012; Mîndrilă, 2016; Trizano-Hermosilla & Alvarado, 2016). Based on simulation studies which compared estimators under non-normal and categorical data, I recommend using robust estimators like McDonald's ω and greatest lower bound algebraic (GLBa) for internal consistency (Dunn, Baguley, & Brunsden, 2014; Sijtsma, 2009; Trizano-

Hermosilla & Alvarado, 2016) and diagonally weighted least square (DWLS) estimation in SEM for evaluation of dimensionality (Bandalos, 2014; Mîndrilă, 2016).

Measurement invariance. Measurement invariance describes the equivalence of constructs across different groups or points in time and is a prerequisite to compare means across respective groups (Putnick & Bornstein, 2016). Measurement invariance is especially important in Dark Triad research, because researchers frequently examine group differences (e.g., sex differences; Furnham et al., 2013). However, frequent German adaptations of well-established self-report questionnaires like NPI-15 (with a 6-point scale) and MACH* have not been investigated thoroughly in terms of measurement invariance in gender groups. Other questionnaires like the SRP-III showed inconsistent strength of invariance depending on the form used and population studied (Dotterer et al., 2017; Neal & Sellbom, 2012). Furthermore, many psychological studies rely on student samples and research indicates that associations of variables differ in students compared to the general public (Hanel & Vione, 2016; Peterson, 2001). Therefore, measurement invariance comparing students and non-students should be conducted to determine if the Dark Triad is measured equivalently across groups. To my knowledge, no study so far has investigated the measurement invariance of the NPI-15, MACH* and SRP-III in one statistical model.

The present study

As outlined above, there remain many open questions regarding the associations of different aspects of mating behavior and dark personality traits. Previous research showed inconsistent results, did mostly not examine associations on a facet level and did only sparsely investigate the role of covert narcissism. The present study examines the associations of dark personality facets (antisocial, impulsive thrill-seeking and interpersonal manipulation facets of psychopathy; Machiavellianism; grandiose, leadership personality, egocentric and oversensitive facets of narcissism) with infidelity experience, intention towards infidelity, romantic jealousy-induction and cognitive jealousy under consideration of confounding influences of sex. Based on previous research, positive associations between all dark personality facets and infidelity experience, intention towards infidelity, romantic jealousy-induction, and cognitive jealousy are expected. Moreover, I assume that facets of hypersensitive narcissism (egocentric and oversensitive narcissism) show stronger associations with cognitive jealousy and that facets of psychopathy show stronger relations with infidelity in comparison to other dark personality facets. The associations of dark personality facets and aspects of mating behavior were

investigated using product-moment correlation and OLS regression. To overcome the methodological challenges outlined above, ridge regression was used to secure results from OLS regression. Furthermore, exploratory analysis was conducted to examine the relations of attractiveness ratings and dark personality traits using verbal descriptions and facial attractiveness ratings. In addition, the factorial structure of dark personality traits was examined using SEM and ESEM with items as a basic unit. Moreover, measurement invariance of NPI-15, MACH* and SRP-III with sex and educational status (students/no students) as grouping variables was investigated.

Method

Participants and procedure

749 participants ($M_{Age} = 34.28$, $SD_{Age} = 15.86$, age range: 18-81 years) completed the present study's survey. 401 participants were women (54 %, $M_{Age} = 35.12$, $SD_{Age} = 16.08$, age range: 19-81 years), 342 were men (46 %, $M_{Age} = 33.53$, $SD_{Age} = 15.64$, age range: 18-80 years), three indicated that they have a non-binary gender, and three participants did not specify their gender. 299 participants (40 %) were university students (of which 76 were psychology students), 440 participants (59 %) were not enrolled in university classes, and 10 participants (1 %) did not indicate if they were students. 171 participants (23 %) had no current job, 128 (17 %) worked under marginal employment, 101 (13 %) were working part-time, 234 were working full-time (31 %), 101 (13 %) did not fit into one of these categories (were self-employed, in retraining, civilian service, etc.), and 14 participants (2 %) did not specify their employment status. Table 1 displays further demographic data of study participants concerning education level, relationship status and nationality.

Table 1

Demographic data of study participants

Variable	Category	Frequency	%
Sex	Male	342	46
	Female	401	54
	Non-binary	3	< 1
	Not specified	3	< 1
Education level	Compulsory school	88	12
	Apprenticeship/craftsman's certificate	116	15
	Vocational school	37	5
	High school	330	44
	Bachelor's, Master's or diploma degree	165	22
	PhD	8	1
	Not specified	5	1
Relationship status	Single	231	31
	In a relationship	289	39
	Married	193	26
	Separated or divorced	16	2
	Widowed	4	1
	Not specified	16	2
Nationality	Austrian	322	43
	German	384	51
	Other	31	4
	Not specified	12	2

Note. Education level refers to the highest category met.

Participants were recruited by students in an undergraduate Psychology course at the University of Vienna between March and June 2018. The study was conducted in a cross-sectional design. 388 participants used a PDF document and 361 a paper-and-pencil version to fill out the survey. All participants gave written informed consent. There were two conditions, which differed in an adapted vignette reported by Qureshi et al. (2016): 384 participants received a vignette in which a person with high and 365 received a vignette in which a person with low psychopathy manifestations was described (see below).

Measures

Cronbach's coefficient α , McDonald's ω , GLBa, and descriptive statistics of scales are displayed in Table 2.

Table 2

Reliability and descriptive statistics of scales used

Dimension	Scale	Number of items	<i>M</i>	<i>SD</i>	ω	α	GLBa
Overt narcissism	Leadership personality	10	3.01	0.51	.83	.83	.87
	Grandiosity	5	3.02	0.38	.89	.89	.94
Covert narcissism	Oversensitivity	6	3.05	0.23	.66	.64	.7
	Egocentrism	4	2.12	0.34	.58	.56	.6
Machiavellianism	Machiavellianism	5	2.8	0.37	.78	.77	.83
Psychopathy	Interpersonal manipulation	7	2.53	0.56	.66	.64	.74
	Impulsive thrill-seeking	9	2.4	0.37	.83	.82	.82
	Antisocial behavior	10	1.77	0.62	.77	.76	.86
Jealousy	Cognitive Jealousy	8	2.22	0.73	.92	.9	.95
	Romantic jealousy-induction	10	1.39	0.2	.93	.92	.96
Infidelity	Infidelity experience	5	0.3	0.24	.82	.8	.84
	Intention towards infidelity	7	2.47	0.91	.77	.63	.77

Note. *N*'s range from 630 to 741 due to occasional missing data. ω = McDonald's ω . α = Cronbach's α . GLBa = Greatest lower bound algebraic.

Narcissistic Personality Inventory (NPI). The NPI-15 (Schütz, Marcus, & Sellin, 2004) measures narcissism with 15 items in non-clinical populations. Participants were asked to indicate their agreement to statements such as "I have a natural talent for influencing people". Considering recommendations of prior research, a 6-point scale (1: *Strongly disagree*; 6: *Strongly agree*) was used instead of the original forced-choice format (Kubarych, Deary, & Austin, 2004). Higher scores indicate higher narcissism.

Hypersensitive Narcissism Scale (HSNS). The HSNS (Hendin & Cheek, 1997) measures vulnerable narcissism with 10 items in non-clinical populations. Participants were asked to indicate how well statements such as “I can easily become entirely absorbed in thinking about my personal affairs, my health, my cares, or my relations to others” describe their experiences and behavior on a 5-point scale (1: *Very uncharacteristic or untrue*; 5: *Very characteristic or true*).

MACH*. The MACH* (Rauthmann, 2013), which is a short version of the MACH-IV (Christie & Geis, 1970), assesses Machiavellianism. The five items included were the ones with the highest measurement precision in IRT analysis (Rauthmann, 2013). Participants were asked to indicate their agreement to statements such as “Never tell anyone the real reason you did something unless it is useful to do so” on a 6-point scale (1: *Strongly disagree*; 6: *Strongly agree*).

Self-Report Psychopathy Scale III (SRP-III). The SRP-III (Küfner et al., 2014) assesses four different facets of psychopathy in non-clinical populations with 31 items. Participants were asked to indicate their agreement to statements such as “I think I could beat a lie detector” on a 5-point scale (1: *Strongly disagree*; 5: *Strongly agree*). Based on CFA (see results section) only three of four subscales (antisocial behavior, interpersonal manipulation and impulsive thrill-seeking) were used to compute composite scores.

Kinsey scale. The Kinsey scale (Kinsey, Pomeroy, & Martin, 1948) measures sexual orientation with one item on an 8-point scale (1: *Exclusively heterosexual*; 2: *Predominantly heterosexual, only incidentally homosexual*; 3: *Predominantly heterosexual, but more than incidentally homosexual*; 4: *Equally heterosexual and homosexual*; 5: *Predominantly homosexual, but more than incidentally heterosexual*; 6: *Predominantly homosexual, only incidentally heterosexual*; 7: *Exclusively homosexual*; 8: *No socio-sexual contacts or reactions*). This scale was used to control for sexual orientation when examining facial attractiveness ratings and their associations to dark personality traits.

Facial attractiveness ratings. Participants rated the attractiveness of 12 composite faces (respectively six men and women) on a 5-point scale (1: *Not at all attractive*; 5: *Very attractive*). The morphed faces showed Caucasian men and women who completed self-ratings and underwent peer-ratings about Dark Triad traits (Holtzman, 2011). Each composite face represents either a low or a high manifestation in one of the Dark Triad traits.

Self-descriptions representing low/high Dark Triad manifestations. Two self-descriptions from Qureshi et al. (2016) were translated into German and were rephrased gender-neutral (see Appendix A). One of the self-descriptions contained a description of a person with high and the other one a description of a person with low manifestations in psychopathy. The participants were asked to imagine that they were searching for a partner using an online dating platform and a person introduced him or herself with a text. Then, one of the two self-descriptions was presented. The participants indicated on a 6-point scale how attractive they found the person described (1: *Strongly disagree*; 6: *Strongly agree*), if they could imagine a short-term relationship (1: *Not at all*; 6: *Very much*) and if they could imagine a long-term relationship with this person (1: *Not at all*; 6: *Very much*).

Multidimensional Jealousy Scale (MJS). The cognitive jealousy subscale (CJS) of the Multidimensional Jealousy Scale (Pfeiffer & Wong, 1989) measures cognitive jealousy with eight items. The participants were asked to indicate how often they had or have specific jealous thoughts concerning their current or previous romantic partner (e.g., “I suspect that X is secretly seeing someone of the opposite sex”) on a 7-point scale (1: *Never*; 4: *Occasionally*; 7: *Often*).

Romantic Jealousy-Induction Scale (RJIS). A shortened form of the RJIS (Mattingly, Whitson, & Mattingly, 2012) was used to measure jealousy-induction. Participants were asked to indicate their agreement with statements such as “I flirt with people in front of X in order to make X jealous.” on a 7-point scale (1: *Never*; 4: *Occasionally*; 7: *Often*).

Infidelity Experience Scale (IES). The IES (Brewer et al., 2015) measures previous experiences of infidelity. Participants were asked, if they had engaged in five different behaviors (e.g., had a one night stand, while in a relationship) using a forced choice format (1: *Yes*; 2: *No*).

Intention towards Infidelity Scale (ITIS). The ITIS (Jones, Olderbak, & Figueredo, 2013) measures intentions towards infidelity on a 7-point scale (-3: *Not at all likely*; 3: *Extremely likely*). Participants were asked to indicate how likely it is that they would show unfaithful behavior using seven items (e.g., “How likely do you think you are to be unfaithful to future partners?”).

Analysis

SEM analysis were conducted using the lavaan-package (Rosseel, 2012) in R-Studio (RStudio Team, 2015) and ESEM analysis were run in Mplus 8.2 (Muthén & Muthén, 2017). To account for non-normal distributions on an item-level, DWLS estimators were used in SEM and

ESEM. Additionally, robust standard errors and mean and variance corrected chi-square statistics were computed in ESEM. To validate whether the previously hypothesized unidimensional factor structures of subscales were valid in the sample of the present study, I tested the unidimensionality of all scales using CFA (Boateng et al., 2018). In accordance with Kline (2015), I report the following fit indices: root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI) and standardized root mean square residual (SRMR). Having in mind, that cut-offs for fit indices in SEM are only a rule of thumb (Kline, 2015), the following standard criteria for an adequate model fit were used: RMSEA values <0.06 , CFI values >0.95 , and SRMR values <0.08 (Hu & Bentler, 1999). Factor loadings from CFA were used as multiplicative weights to compute weighted sum scores for each scale of the Dark Triad questionnaires (Distefano, Zhu, & Mîndrilă, 2009). Weighted sum scores were used as predictors in regression models. Assumptions of multiple linear regression were examined (Field, 2013). Ridge regression were performed using the *lmridge* package (Ullah, Muhammad, Aslam, & Altaf, 2018) and OLS regression were conducted using standard functions in R-Studio (RStudio Team, 2015). In analyses of facial attractiveness ratings and their associations to dark personality traits, only heterosexual and bisexual participants were included, because sexual preferences have been shown to modulate face perception (Kranz & Ishai, 2006) and the present study aims to investigate attractiveness ratings in the context of mating behavior.

Results

Preliminary Analysis

Missing data. All main variables were analyzed concerning missing data. Missing data for all main variables was below 5 %, except for the Intention towards Infidelity scale (6.3 %) and the Infidelity Experience scale (15.9 %). Little's MCAR test indicated that the data was missing completely at random ($\chi^2(408) = 438.401, p = .144$). Data analysis was conducted with pairwise deletion.

Outliers. All main variables were winsorized at 2.5 standard deviations above and below the mean. Percentage of data below and above this cut-off ranged from 0 % to 2.8 % ($M = 1.29, SD = 0.01$).

Dimensionality of questionnaires. The factorial structure of all scales measuring main variables was investigated using CFA. See Appendix B for detailed description of analysis and

models which were compared. Below, only final models which were chosen as a rationale for sum score computation are described.

Dark personality facets. For narcissism, a two-factor model including a leadership personality and grandiosity facet yielded, except for RMSEA, an acceptable fit ($\chi^2(89) = 463.890, p < 0.001$; RMSEA = 0.077; SRMR = 0.079; CFI = 0.972; TLI = 0.966). For hypersensitive narcissism, a two-factor model with an oversensitivity and egocentrism facet (Fossati et al., 2009), yielded the best, but unacceptable, fit indices ($\chi^2(34) = 194.086, p < 0.001$; RMSEA = 0.081; SRMR = 0.074; CFI = 0.855; TLI = 0.808). For Machiavellianism, a one-factor model yielded acceptable fit indices ($\chi^2(5) = 13.256, p = .021$; RMSEA = 0.048; SRMR = 0.039; CFI = 0.992; TLI = 0.985). For psychopathy, a three-factor model including an impulsive thrill-seeking, interpersonal manipulation and antisocial facet yielded acceptable fit indices ($\chi^2(296) = 639.450, p < .001$; RMSEA = 0.040; SRMR = 0.064; CFI = 0.965; TLI = 0.962).

Dependent variables. Table 3 displays the fit indices of one-factor models for each of the scales which measured dependent variables. Goodness-of-fit indicators were all acceptable. Badness-of-fit indicators were acceptable, except for the SRMR and RMSEA in the CJS and RMSEA in the ITIS. Sum scores were computed for all dependent variables.

Table 3

Goodness- and badness-of-fit indicators of confirmatory factor analysis of scales measuring dependent variables

Questionnaire	χ^2	df	RMSEA	SRMR	CFI	TLI
CJS	91.222***	20	0.070	0.103	0.974	0.964
RJIS	16.021	35	< 0.001	0.072	1.000	1.019
IES	8.792	5	0.035	0.034	0.996	0.993
ITIS	62.571***	14	0.070	0.074	0.956	0.934

Note. *N*'s range from 630 to 725 due to occasional missing data. CJS = Cognitive Jealousy Scale; RJIS = Romantic Jealousy-Induction Scale; IES = Infidelity Experience Scale; ITIS = Intention towards Infidelity Scale. DWLS estimator and items as a basic unit used.

*** $p < .001$.

Evaluation of assumptions for multiple linear OLS regression. Multicollinearity, homoscedasticity, distribution of errors and linearity of associations were investigated for all regression models (see Appendix C). Assumptions were met, except for non-normal distribution of errors in models predicting romantic jealousy-induction and infidelity experiences. Therefore, I secured results using ridge regression.

Associations of covariates and main variables. Relations of gender, relationship status, age and all main variables were analyzed using variance analysis and correlations. Correlations of age and all main variables are displayed in Table 4. Table 5 and 6 display results of Welch's *t*-tests using sex and relationship status respectively as grouping variables. Sex differences occurred in all main variables except cognitive jealousy and romantic jealousy-induction. Men showed significantly higher scores in all variables except infidelity experience and oversensitivity where women scored significantly higher ($\alpha = .05$). Relationship status had a significant influence on all variables except antisocial psychopathy, egocentrism and infidelity experience. Participants who were in a relationship or married, scored significantly lower on all variables where differences were found. Age was negatively associated with all facets of psychopathy, grandiosity, leadership personality and oversensitivity facets of narcissism, cognitive jealousy, romantic jealousy-induction and intention towards infidelity. Age was positively related to infidelity experiences.

Table 4

Means, standard deviations, and correlations with confidence intervals of main variables

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	34.28	15.86												
2. SRPIII_ITS	12.44	4.25	-.31** [-.37, -.24]											
3. SRPIII_ASB	8.63	3.50	-.27** [-.34, -.21]	.61** [.56, .65]										
4. SRPIII_IM	7.17	2.34	-.29** [-.36, -.22]	.58** [.53, .63]	.50** [.44, .55]									
5. NPI15_GRAND	10.57	3.97	-.34** [-.40, -.28]	.46** [.40, .51]	.27** [.20, .34]	.41** [.35, .47]								
6. NPI15_LEAD	20.05	6.66	-.17** [-.24, -.09]	.42** [.36, .48]	.20** [.13, .27]	.35** [.29, .42]	.73** [.69, .76]							
7. HSNS_OVERS	9.14	2.28	-.11** [-.19, -.04]	-.00 [-.08, .07]	.02 [-.05, .10]	-.03 [-.10, .05]	.16** [.09, .23]	.01 [-.06, .08]						
8. HSNS_EGO	4.25	1.40	-.01 [-.08, .07]	.21** [.14, .28]	.14** [.06, .21]	.23** [.16, .30]	.20** [.12, .27]	.13** [.06, .20]	.19** [.12, .26]					
9. MACH	8.98	3.49	-.04 [-.11, .03]	.14** [.07, .21]	.11** [.03, .18]	.26** [.19, .33]	.06 [-.01, .13]	.02 [-.05, .10]	.07 [-.01, .14]	.39** [.33, .45]				
10. CJS	17.53	8.81	-.23** [-.30, -.16]	.23** [.16, .30]	.17** [.10, .24]	.23** [.16, .29]	.17** [.09, .24]	.04 [-.03, .12]	.22** [.15, .29]	.19** [.11, .26]	.23** [.16, .30]			
11. RJIS	13.58	5.68	-.18** [-.25, -.11]	.28** [.22, .35]	.17** [.09, .24]	.25** [.18, .32]	.20** [.13, .27]	.18** [.11, .25]	.14** [.07, .21]	.17** [.10, .24]	.14** [.07, .22]	.42** [.35, .48]		
12. IES	1.51	1.51	.16** [.09, .24]	.17** [.10, .25]	.17** [.09, .25]	.07 [-.01, .15]	.06 [-.02, .14]	.16** [.08, .24]	.03 [-.05, .11]	.06 [-.02, .14]	-.01 [-.09, .07]	.07 [-.01, .14]	.19** [.11, .26]	
13. ITIS	17.19	6.41	-.07 [-.14, .01]	.25** [.18, .32]	.19** [.11, .26]	.25** [.18, .32]	.16** [.08, .23]	.13** [.06, .21]	.12** [.05, .20]	.17** [.10, .24]	.10* [.02, .17]	.25** [.18, .32]	.29** [.22, .35]	.45** [.38, .51]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; CJS = Cognitive Jealousy; RJIS = Romantic Jealousy-Induction; IES = Infidelity Experience; ITIS = Intention towards Infidelity.

* $p < .05$. ** $p < .01$.

Table 5

Welch's t-test for all main variables, using sex as a grouping variable

	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>	95% CI for Cohen's <i>d</i>	
					Lower	Upper
SRPIII_ITS	-8.09	684.63	< .001	-0.60	-0.75	-0.45
SRPIII_ASB	-6.72	628.44	< .001	-0.51	-0.65	-0.36
SRPIII_IM	-8.69	671.89	< .001	-0.65	-0.80	-0.50
NPI15_GRAND	-4.73	698.87	< .001	-0.35	-0.50	-0.21
NPI15_LEAD	-5.61	701.69	< .001	-0.42	-0.57	-0.27
HSNS_OVERS	5.66	702.48	< .001	0.42	0.27	0.57
HSNS_EGO	-6.16	684.16	< .001	-0.46	-0.61	-0.31
MACH	-3.90	665.76	< .001	-0.30	-0.44	-0.15
CJS	-1.85	684.13	.065	-0.14	-0.29	0.01
RJIS	0.24	692.83	.815	0.02	-0.13	0.17
IES	1.98	613.02	.048	0.16	0.00	0.32
ITIS	-3.46	658.97	< .001	-0.26	-0.41	-0.11

Note. Welch's *t*-test. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; CJS = Cognitive Jealousy; RJIS = Romantic Jealousy-Induction; IES = Infidelity Experience; ITIS = Intention towards Infidelity.

Table 6

Welch's t-test for all main variables, using relationship status as a grouping variable

	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>	95% CI for Cohen's <i>d</i>	
					Lower	Upper
SRPIII_ITS	2.87	537.32	.004	0.22	0.07	0.37
SRPIII_ASB	1.45	545.07	.148	0.11	-0.04	0.26
SRPIII_IM	2.97	534.40	.003	0.23	0.08	0.38
NPI15_GRAND	4.63	524.92	< .001	0.36	0.21	0.51
NPI15_LEAD	2.17	508.03	.031	0.17	0.02	0.32
HSNS_OVERS	2.48	518.42	.014	0.19	0.04	0.35
HSNS_EGO	0.95	513.65	.343	0.07	-0.08	0.23
MACH	2.85	508.35	.005	0.22	0.07	0.38
CJS	8.63	402.66	< .001	0.70	0.54	0.86
RJIS	4.16	384.48	< .001	0.34	0.19	0.5
IES	-1.54	444.19	.125	-0.13	-0.30	0.04
ITIS	3.72	479.82	< .001	0.30	0.14	0.45

Note. Welch's *t*-test. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; CJS = Cognitive Jealousy; RJIS = Romantic Jealousy-Induction; IES = Infidelity Experience; ITIS = Intention towards Infidelity.

Structural Analysis of Dark Personality Traits

SEM analysis. SEM with items as a basic unit were conducted to investigate the factorial structure of dark personality traits. Items from MACH*, SRP-III and NPI-15 were included into the analysis. The items of the cold affect facet of psychopathy were excluded from SEM analysis, because lavaan did not converge normally under inclusion of this scale. Table 7 displays the fit indices of different models. See Appendix D for path diagrams including factor loadings of all models which were analyzed. A one-factor model representing the Dark Core (see Figure D1), a three-factor model representing the Dark Triad (see Figure D2), a six-factor model representing a structure with one factor per unidimensional subscale (see Figure D3), a hierarchical model with six lower-order factors and three higher-order factors (hierarchical Dark Triad model, see Figure D4) and a hierarchical model with six lower-order factors and one higher-order factor (hierarchical Dark Core model, see Figure D5) were compared. The lower-order factors in the hierarchical models were the same as in the six-factor model (antisocial behavior, interpersonal manipulation, impulsive thrill-seeking, grandiosity, leadership personality and Machiavellianism). In all models, sample size was too small to compute gamma. Based on standard criteria for model evaluation (Hu & Bentler, 1999), only the six-factor model and the hierarchical Dark Triad model showed adequate fit indices.

Table 7

Goodness- and badness-of-fit indicators of confirmatory factor analysis

Model	χ^2	df	RMSEA	SRMR	CFI	TLI
One-factor model	6170.376***	989	0.090	0.105	0.827	0.819
Three-factor model	2770.500***	986	0.053	0.071	0.941	0.938
Six-factor model	2248.412***	974	0.045	0.063	0.958	0.955
Hierarchical Dark Triad model	2428.080***	981	0.048	0.066	0.952	0.949
Hierarchical Dark Core model	3721.701***	983	0.065	0.081	0.909	0.904

Note. $N = 652$. DWLS estimator and items as a basic unit used.

*** $p < .001$.

ESEM analysis. To validate findings from SEM, ESEM analysis were conducted using items as a basic unit. I used DWLS estimators, computed robust standard errors and mean and variance corrected chi-square statistics to account for non-normal distributions and Geomin factor rotation. All items from MACH*, SRP-III and NPI-15 were included into analysis. Factor loadings of a one-factor model representing the Dark Core, a three-factor model representing the Dark Triad, a four-factor model and a five-factor model are displayed in Table E1, E2, E3 and E4 (see Appendix E). Table 8 displays the fit indices of the different models. The five-factor model displayed the best fit. However, investigation of factor loadings indicated that two out of five factors did not conform to theoretical expectations (see Table E4). The fourth factor in the five-factor model had both high positive and negative loadings from the leadership personality scale of the NPI-15 and the fifth factor had high positive loadings from the grandiosity scale of the NPI-15 and mostly high negative loadings from the antisocial behavior scale of the SRP-III. The three- and the four-factor model displayed theoretically sound factor loadings. The three-factor model included one factor with high loadings from NPI-15, one factor with high loadings from MACH* and one factor with high loadings from SRP-III (see Table E2). The four-factor model included one factor with high loadings from the grandiosity scale of NPI-15, one factor with high loadings from the leadership personality scale of NPI-15, one factor with high loadings from MACH*, and one factor with high loadings from SRP-III (see Table E3). However, the items from NPI-15 showed substantial cross-loadings in the four-factor model. In all models, items from the interpersonal manipulation and cold affect facet of psychopathy did not show factor loadings as theoretically expected. Based on standard criteria for model evaluation (Hu & Bentler, 1999), only the five-factor model showed an adequate fit (except for CFI value).

Table 8

Goodness- and badness-of-fit indicators of different models in ESEM framework

Model	χ^2	<i>df</i>	RMSEA	SRMR	CFI	TLI
One-factor model	9504.962***	1224	0.096	0.118	0.666	0.652
Three-factor model	4122.437***	1125	0.060	0.064	0.879	0.863
Four-factor model	3275.971***	1077	0.053	0.056	0.911	0.895
Five-factor model	2844.468***	1030	0.049	0.048	0.927	0.909

Note. $N = 734$. DWLS estimator, robust standard errors and mean and variance corrected chi-square statistics, and Geomin rotation used.

*** $p < .001$.

Measurement invariance. Following recommendations of Putnick and Bornstein (2016), configural, metric, scalar, and residual invariance were tested in a sequential procedure in multi-group SEM to determine, if the factorial structure of NPI-15, SRP-III and MACH* is comparable in different subgroups (sex and educational status). Detailed descriptions of results and methodology can be found in Appendix F. Under consideration of standard criteria for model evaluation (Hu & Bentler, 1999), residual invariance can be assumed for groups with different educational statuses (university and no university students) and configural invariance can be assumed for individuals with different sexes.

Dark Personality Facets and Mating Behavior

Dark personality facets, jealousy and infidelity. Table 4 displays product-moment correlations of all main variables. Cognitive jealousy showed significant positive correlations with all dark personality facets, except leadership personality. Romantic jealousy-induction and intention towards infidelity were positively associated with all dark personality facets. Infidelity experience was positively associated with leadership personality, impulsive thrill-seeking and antisocial behavior. To determine which facets were unique predictors of the outcome variables under the consideration of shared variances between predictors, I conducted OLS regression with weighted sum scores of scales measuring dark personality facets as predictors and respectively infidelity experience, intention towards infidelity, romantic jealousy-induction, and cognitive

jealousy as dependent variables. Results are displayed in Table 9 and Table 10. When using infidelity experience as a dependent variable, antisocial behavior, grandiosity, and leadership personality were the only unique predictors. All predictors explained 6.8 % variance of infidelity experience. For intention towards infidelity, the unique predictors were impulsive thrill-seeking, interpersonal manipulation, egocentrism and oversensitivity. The explained variance of intention towards infidelity was 9.6 %. When romantic jealousy-induction was used as a criterion, unique predictors were impulsive thrill-seeking, interpersonal manipulation and oversensitivity. All predictors explained 10.9 % variance of romantic jealousy-induction. When using cognitive jealousy as a dependent variable, impulsive thrill-seeking, leadership personality, oversensitivity, grandiosity, and Machiavellianism were unique predictors. The explained variance of cognitive jealousy was 14.7 %.

Table 9

Regression results of dark personality facets predicting infidelity

Criterion	Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>r</i>	Fit
Infidelity experience	(Intercept)	0.08	[-0.65, 0.80]				
	SRPIII_ITS	0.03	[-0.01, 0.07]	0.09	[-0.03, 0.22]	.17**	
	SRPIII_ASB	0.06*	[0.01, 0.11]	0.14	[0.03, 0.26]	.17**	
	SRPIII_IM	-0.05	[-0.11, 0.02]	-0.07	[-0.18, 0.04]	.08	
	NPI15_GRAND	-0.06*	[-0.11, -0.01]	-0.16	[-0.29, -0.03]	.09*	
	NPI15_LEAD	0.05**	[0.02, 0.08]	0.23	[0.11, 0.36]	.17**	
	HSNS_OVERS	0.03	[-0.02, 0.09]	0.05	[-0.03, 0.14]	.04	
	HSNS_EGO	0.06	[-0.04, 0.16]	0.05	[-0.04, 0.15]	.08	
	MACH	-0.01	[-0.05, 0.02]	-0.03	[-0.13, 0.06]	.00	
							$R^2 = .068^{**}$ 95% CI[.02,.10]
Intentions towards infidelity	(Intercept)	6.83**	[3.87, 9.79]				
	SRPIII_ITS	0.17*	[0.00, 0.34]	0.11	[0.00, 0.23]	.24**	
	SRPIII_ASB	0.09	[-0.10, 0.27]	0.05	[-0.05, 0.15]	.20**	
	SRPIII_IM	0.32*	[0.05, 0.60]	0.12	[0.02, 0.22]	.23**	
	NPI15_GRAND	0.02	[-0.17, 0.21]	0.01	[-0.11, 0.13]	.17**	
	NPI15_LEAD	0.02	[-0.09, 0.13]	0.02	[-0.10, 0.13]	.13**	
	HSNS_OVERS	0.31**	[0.09, 0.54]	0.11	[0.03, 0.19]	.12**	
	HSNS_EGO	0.40*	[0.00, 0.80]	0.09	[0.00, 0.17]	.17**	
	MACH	0.00	[-0.16, 0.16]	0.00	[-0.08, 0.09]	.10*	
							$R^2 = .096^{**}$ 95% CI[.05,.13]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table 10

Regression results of dark personality facets predicting jealousy

Criterion	Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>r</i>	Fit
Romantic jealousy-induction	(Intercept)	3.65**	[1.12, 6.18]				
	SRPIII_ITS	0.21**	[0.06, 0.36]	0.16	[0.05, 0.27]	.26**	
	SRPIII_ASB	-0.03	[-0.19, 0.13]	-0.02	[-0.12, 0.08]	.17**	
	SRPIII_IM	0.27*	[0.04, 0.51]	0.11	[0.02, 0.21]	.24**	
	NPI15_GRAND	-0.02	[-0.18, 0.15]	-0.01	[-0.13, 0.11]	.20**	
	NPI15_LEAD	0.07	[-0.02, 0.16]	0.08	[-0.03, 0.20]	.19**	
	HSNS_OVERS	0.31**	[0.11, 0.51]	0.12	[0.05, 0.20]	.14**	
	HSNS_EGO	0.18	[-0.16, 0.53]	0.04	[-0.04, 0.13]	.15**	
	MACH	0.08	[-0.06, 0.21]	0.05	[-0.04, 0.13]	.13**	
							$R^2 = .109^{**}$ 95% CI[.06,.15]
Cognitive jealousy	(Intercept)	1.77	[-2.16, 5.70]				
	SRPIII_ITS	0.36**	[0.13, 0.58]	0.17	[0.06, 0.28]	.24**	
	SRPIII_ASB	0.03	[-0.21, 0.28]	0.01	[-0.08, 0.11]	.18**	
	SRPIII_IM	0.27	[-0.10, 0.64]	0.07	[-0.03, 0.17]	.22**	
	NPI15_GRAND	0.30*	[0.04, 0.55]	0.14	[0.02, 0.25]	.17**	
	NPI15_LEAD	-0.21**	[-0.36, -0.07]	-0.16	[-0.27, -0.05]	.05	
	HSNS_OVERS	0.68**	[0.38, 0.99]	0.18	[0.10, 0.25]	.20**	
	HSNS_EGO	0.17	[-0.36, 0.70]	0.03	[-0.06, 0.11]	.18**	
	MACH	0.37**	[0.16, 0.58]	0.15	[0.06, 0.23]	.22**	
							$R^2 = .147^{**}$ 95% CI[.09,.19]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

To secure results, I replicated all OLS regression models using ridge regression. Following recommendations of Golub, Heath, and Wahba (1979), a cross-validation method has been used to determine the value of the tuning parameter λ . Predictors were standardized before the analysis to have a mean of zero and a standard deviation of one unit. Ridge regression replicated results of all OLS regression models. When using infidelity experience as a dependent variable, antisocial behavior ($\beta = 0.21, p = .012$), grandiosity ($\beta = -0.24, p = .018$), and leadership personality ($\beta = 0.34, p > .001$) remained unique predictors. For intention towards infidelity, impulsive thrill-seeking ($\beta = 0.73, p = .0473$), interpersonal manipulation ($\beta = 0.76, p = .022$), egocentrism ($\beta = 0.56, p = .049$), and oversensitivity ($\beta = 0.72, p = .006$) stayed unique predictors. When romantic jealousy-induction was used as a criterion, impulsive thrill-seeking ($\beta = 0.89, p = .005$), interpersonal manipulation ($\beta = 0.65, p = .024$), and oversensitivity ($\beta = 0.70, p = .002$) remained unique predictors. For cognitive jealousy, impulsive thrill-seeking ($\beta = 1.52, p = .002$), leadership personality ($\beta = -1.44, p = .004$), oversensitivity ($\beta = 1.56, p < .001$), grandiosity ($\beta = 1.20, p = .022$), and Machiavellianism ($\beta = 1.30, p < .001$) remained unique predictors.

To determine differential relations of predictors and dependent variables among men and women, regression analysis was separately conducted in both subgroups. Table G1, G2, G3, G4 display results of OLS regression in females and Table G5, G6, G7 and G8 display results in the subgroup of males (see Appendix G). Table 11 gives a summary of unique predictors per subgroup and outcome variable. Among men and women, infidelity experience was predicted by antisocial behavior and leadership personality. Intention towards infidelity was predicted by impulsive thrill-seeking and interpersonal manipulation in women and by oversensitivity in men. Romantic jealousy-induction was predicted by interpersonal manipulation in women and by impulsive thrill-seeking in men. Among women, cognitive jealousy was predicted by antisocial behavior, leadership personality and Machiavellianism, whereas among men, cognitive jealousy was predicted by impulsive thrill-seeking and oversensitivity.

Table 11

Unique predictors in OLS regression models in subgroups

Subgroup	Outcome	Unique Predictors	<i>beta</i>	<i>R</i> ²
Female	IES	SRPIII_ASB	0.15*	.072**
		NPI15_LEAD	0.19*	
	ITIS	SRPIII_ITS	0.17*	.129**
		SRPIII_IM	0.15*	
	RJIS	SRPIII_IM	0.21**	.157**
	CJS	SRPIII_ASB	0.13*	.153**
		NPI15_LEAD	-0.22**	
		MACH	0.14*	
Male	IES	SRPIII_ASB	0.18*	.128**
		NPI15_LEAD	0.28**	
	ITIS	HSNS_OVERS	0.17**	.065*
	RJIS	SRPIII_ITS	0.21*	.118**
	CJS	SRPIII_ITS	0.27**	.179**
		HSNS_OVERS	0.26**	

Note. *N*'s range from 240 to 325 due to occasional missing data. *R*² refers to explained variance of all, not only unique, predictors. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; MACH = Machiavellianism; CJS = Cognitive Jealousy; RJIS = Romantic Jealousy-Induction; IES = Infidelity Experience; ITIS = Intention towards Infidelity.

* $p < .05$. ** $p < .01$.

Dark personality facets and attractiveness.

Associations of verbal descriptions and facial attractiveness ratings. Among men, facial attractiveness ratings of women high in Dark Triad traits correlated positively with interest in a short-term relationship ($r = .22, p = .004$) and long-term relationship ($r = .18, p = .021$) with women who were characterized by high psychopathy manifestations in verbal descriptions. Among women, facial attractiveness ratings depicting men high in Dark Triad traits correlated positively with verbal attractiveness ratings of men low in psychopathy ($r = .25, p = .001$).

Analysis of the associations of facial attractiveness ratings and dark personality traits were conducted under consideration of sexual orientation. Only heterosexual and bisexual participants were included into subgroup analysis.

Verbal descriptions. Table 12 and 13 display comparisons of the attractiveness ratings in the high psychopathy vignette and the low psychopathy vignette, respectively for men and women using *t*-tests. Both sexes rated the attractiveness of the description illustrating a person with high psychopathy less attractive in comparison to the low psychopathy vignette. Interest in a long-term relationship was also significantly lower in the high psychopathy condition. No significant differences were found for interest in a short-term relationship. Table 14 displays product-moment correlations between dark personality facets and the ratings of general attractiveness, interest in a short-term and long-term relationship in the subsets of men and women and for the low and high psychopathy condition.

Table 12

Welch's t-test for ratings of verbal description, grouping based on low/high psychopathy condition (subgroup = male)

	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>	95% CI for Cohen's <i>d</i>	
					Lower	Upper
GEN_ATTR	-2.72	334.84	0.007	-0.30	-0.51	-0.08
SHORT_REL	0.43	337	0.665	0.05	-0.17	0.26
LONG_REL	-2.52	333.42	0.012	-0.27	-0.49	-0.060

Note. Welch's *t*-test. *N* ranging from 337 to 340 due to occasionally missing data. GEN_ATTR = Ratings of general attractiveness; SHORT_REL = Interest in a short-term relationship; LONG_REL = Interest in a long-term relationship.

Table 13

Welch's t-test for ratings of verbal description, grouping based on low/high psychopathy condition (subgroup = female)

	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>	95% CI for Cohen's <i>d</i>	
					Lower	Upper
GEN_ATTR	-4.23	385.26	< .001	-0.43	-0.63	-0.23
SHORT_REL	0.51	391.75	.609	0.05	-0.15	0.25
LONG_REL	-3.34	383.44	< .001	-0.34	-0.54	-0.14

Note. Welch's *t*-test. *N* = 395. GEN_ATTR = Ratings of general attractiveness; SHORT_REL = Interest in a short-term relationship; LONG_REL = Interest in a long-term relationship.

Table 14

Means, standard deviations, and correlations of dark personality facets and verbal attractiveness ratings in different subsets

Subset	Variable	<i>M</i>	<i>SD</i>	SRPIII ITS	SRPIII ASB	SRPIII IM	NPI15 GRAND	NPI15 LEAD	HSNS OVERS	HSNS EGO	MACH	GEN_ATTR	SHORT_REL
F/High_Psy	GEN_ATTR	2.28	1.34	.20** [.07, .33]	.09 [-.05, .22]	.11 [-.03, .24]	.26** [.12, .38]	.19** [.05, .32]	.11 [-.03, .25]	.20** [.07, .33]	.07 [-.07, .21]		
	SHORT_REL	2.12	1.42	.33** [.20, .45]	.18* [.04, .31]	.22** [.08, .34]	.37** [.24, .49]	.27** [.14, .39]	.08 [-.06, .21]	.11 [-.03, .24]	-.06 [-.20, .08]	.47** [.36, .57]	
	LONG_REL	1.78	1.34	.13 [-.01, .26]	.02 [-.11, .16]	.02 [-.12, .15]	.27** [.13, .39]	.15* [.01, .28]	.09 [-.05, .23]	.10 [-.04, .23]	-.07 [-.20, .07]	.63** [.54, .71]	.47** [.36, .57]
F/Low_Psy	GEN_ATTR	2.86	1.39	-.05 [-.19, .10]	-.05 [-.19, .10]	.02 [-.12, .17]	.20** [.05, .33]	.16* [.01, .30]	.03 [-.12, .18]	.07 [-.07, .22]	.15* [.01, .29]		
	SHORT_REL	2.05	1.34	.20** [.06, .34]	.17* [.03, .31]	.15* [.01, .29]	.19** [.05, .33]	.07 [-.08, .22]	.14 [-.00, .28]	.06 [-.09, .20]	-.01 [-.15, .14]	.32** [.19, .45]	
	LONG_REL	2.24	1.40	.03 [-.11, .18]	.08 [-.07, .22]	.19* [.04, .32]	.28** [.14, .41]	.21** [.07, .35]	.10 [-.04, .25]	.11 [-.04, .25]	.02 [-.12, .17]	.68** [.59, .75]	.40** [.27, .52]
M/High_Psy	GEN_ATTR	2.71	1.36	.16* [.00, .30]	.03 [-.12, .18]	.11 [-.04, .26]	.14 [-.01, .29]	.24** [.09, .38]	.01 [-.14, .17]	.02 [-.13, .18]	.21** [.06, .35]		
	SHORT_REL	3.05	1.77	.16* [.00, .30]	.12 [-.04, .26]	.10 [-.06, .24]	.12 [-.03, .27]	.06 [-.10, .21]	.18* [.03, .32]	.01 [-.14, .16]	.03 [-.12, .18]	.31** [.17, .44]	
	LONG_REL	2.31	1.51	-.00 [-.15, .15]	-.00 [-.16, .15]	.01 [-.14, .16]	.05 [-.10, .20]	.09 [-.06, .24]	-.00 [-.15, .15]	-.10 [-.25, .05]	.14 [-.01, .29]	.65** [.55, .73]	.38** [.24, .50]
M/Low_Psy	GEN_ATTR	3.11	1.32	.11 [-.05, .26]	.08 [-.08, .23]	.06 [-.10, .21]	.19* [.04, .33]	.27** [.13, .41]	.11 [-.05, .25]	.09 [-.07, .24]	.20** [.05, .35]		
	SHORT_REL	2.96	1.74	.37** [.23, .50]	.27** [.12, .40]	.28** [.13, .41]	.21** [.06, .35]	.28** [.13, .41]	.18* [.03, .32]	.15* [.00, .30]	.09 [-.06, .24]	.30** [.16, .43]	
	LONG_REL	2.75	1.68	.18* [.02, .32]	.16* [.01, .30]	.08 [-.08, .22]	.26** [.11, .39]	.25** [.10, .38]	.06 [-.09, .21]	-.03 [-.18, .12]	.05 [-.10, .21]	.66** [.57, .74]	.35** [.21, .47]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. F = Subset of women; M = Subset of men; High_Psy = High psychopathy condition; Low_Psy = Low psychopathy condition; SRPIII ITS = Impulsive Thrill Seeking; SRPIII ASB = Antisocial Behavior; SRPIII IM = Interpersonal Manipulation; NPI15 GRAND = Grandiosity; NPI15 LEAD = Leadership personality; HSNS OVERS = Oversensitivity; HSNS EGO = Egocentrism; MACH = Machiavellianism; GEN_ATTR = Ratings of general attractiveness; SHORT_REL = Interest in a short-term relationship; LONG_REL = Interest in a long-term relationship.

* indicates $p < .05$. ** indicates $p < .01$.

Associations of dark personality traits and attractiveness ratings among women. For the verbal description illustrating a person with high psychopathy, grandiosity, impulsive thrill-seeking, leadership personality and egocentrism showed significant positive associations with general attractiveness ratings among women. The interest in a short-term relationship was associated with impulsive thrill-seeking, grandiosity, antisocial behavior, interpersonal manipulation, and leadership personality. The interest in a long-term relationship was positively associated with grandiosity and leadership personality.

For the verbal description illustrating a person with low psychopathy, grandiosity, leadership personality, and Machiavellianism were positively associated with the ratings of general attractiveness among women. Impulsive thrill-seeking, antisocial behavior, interpersonal manipulation, and grandiosity were positively correlated with the interest in a short-term relationship and interpersonal manipulation, grandiosity, and leadership personality were positively associated with the interest in a long-term relationship.

Associations of dark personality traits and attractiveness ratings among men. In the high psychopathy condition, ratings of attractiveness were positively associated with impulsive thrill-seeking, leadership personality, and Machiavellianism among men. Impulsive thrill-seeking and oversensitivity were positively correlated with interest in a short-term relationship. No dark personality facet was significantly associated with interest in a long-term relationship.

In the low psychopathy condition, grandiosity, leadership personality, and Machiavellianism were positively associated with the ratings of general attractiveness among men. Impulsive thrill-seeking, antisocial behavior, interpersonal manipulation, oversensitivity, grandiosity, leadership personality, and egocentrism were positively correlated with interest in a short-term relationship. Impulsive thrill-seeking, antisocial behavior, grandiosity, and leadership personality were positively associated with the interest in a long-term relationship.

Table H1 and H2 display associations of the same variables respectively for both conditions including both sexes in the analysis (see Appendix H).

Facial attractiveness ratings. Composite scores, respectively for attractiveness ratings of low Dark Triad faces and high Dark Triad faces from men and women were computed. Among men and women, the high Dark Triad faces of women were rated the most attractive ($M = 9.18$), the low Dark Triad faces of women were rated the second most attractive ($M = 8.93$), the high Dark Triad faces of men were rated similar attractive ($M = 7.78$) as the low Dark Triad faces of men ($M = 7.76$). The most attractive morphed face was the female face high in narcissism ($M = 3.22$). Descriptive statistics show, that women rated faces of men high in Dark Triad traits ($M = 8.09$) similar attractive as low Dark Triad faces ($M = 8.03$) and that men rated high Dark Triad faces of women ($M = 9.49$) slightly more attractive than low Dark Triad faces ($M = 9.15$).

Table I1 displays product-moment correlations between dark personality facets and attractiveness ratings of morphed faces from men, which were rated by women (see Appendix I). In women, only grandiosity ($r = .11, p = .037$) and leadership personality ($r = .11, p = .047$) correlated significantly with the preferences for high Dark Triad faces.

Table I2 displays product-moment correlations between dark personality facets and attractiveness ratings of morphed faces from women, which were rated by men. Egocentrism ($r = -.20, p = .001$) and Machiavellianism ($r = -.11, p = .050$) correlated negatively with the preferences for high Dark Triad faces and egocentrism ($r = -.12, p = .038$) correlated also negatively with the preference for low Dark Triad faces. As apparent from Table I2, dark personality facets in men were mostly negatively related to the preference of individual high Dark Triad female faces.

Discussion

Summary

Under consideration of factor loadings, structural analysis suggested a three-factorial structure of dark personality traits. Based on standard criteria of model evaluation (Hu & Bentler, 1999) residual invariance can be assumed for groups with different educational statuses and configural invariance can be assumed for groups with different sexes. Based on OLS and ridge regression, antisocial behavior, grandiosity, and leadership personality were unique predictors of infidelity experience. Impulsive thrill-seeking, interpersonal manipulation and oversensitivity were unique predictors of intention towards infidelity and romantic jealousy-induction. Cognitive jealousy was uniquely predicted by impulsive thrill-seeking, leadership personality, oversensitivity, and Machiavellianism. Differential patterns between these associations among

men and women were found in subgroup analysis. Dark personality facets were differently related to verbal and facial attractiveness ratings considering the sex of participants. Among men and women, high Dark Triad traits were rated less attractive and were associated with a smaller interest in a long-term relationship when using verbal descriptions. Numerous Dark Triad traits in men were especially associated with interest in a short-term relationship with women who displayed low Dark Triad traits in verbal descriptions. High and low Dark Triad faces were rated similarly attractive.

Factorial Structure of Dark Personality

Based on fit indices, SEM suggested a six-factor model with a grandiosity, a leadership personality, an antisocial, an interpersonal manipulation, an impulsive thrill-seeking and a Machiavellianism factor. However, fit indices of the hierarchical Dark Triad model with three higher-order factors (Machiavellianism, narcissism and psychopathy) and six lower-order factors were acceptable as well (Hu & Bentler, 1999). When investigating the factorial structure with ESEM, a three-factor model showed the most theoretically sound factor loadings. All other models displayed either considerable cross-loadings (four- and five-factor model) or did not represent all items sufficiently (one-factor model). However, only the five-factor model in ESEM showed acceptable fit indices (except for CFI value) (Hu & Bentler, 1999). As Kline (2015) points out, cut-offs for fit indices are only a rule of thumb. Additionally, lower fit-indices in ESEM in comparison to SEM in the present study are due to the computation of mean and variance corrected chi-square statistics in ESEM but not in SEM analysis. The calculation of fit indices like CFI or RMSEA is based on the chi-square statistic (Xia & Yang, 2019) and a correction will therefore influence fit indices. Xia and Yang (2018) point out, that current applications in lavaan and Mplus for the scaling of fit indices and adjustment of chi-square statistics do not have any theoretical justification. Nevertheless, I conducted all SEM analyses of the present study using DWLS estimators also with mean and variance adjusted chi-square statistics for reasons of transparency (see Appendix J). As apparent from results of re-analyses, fit indices are considerably lower when using mean and variance adjusted chi-square statistics and fit statistics of models do not fulfill standard criteria for adequate model fit (Hu & Bentler, 1999). However, fundamental interpretation of results concerning the factorial structure of dark personality does not change: although fit indices were generally lower, the six-factor and hierarchical Dark Triad model displayed the best fit indices nevertheless. Under consideration of

factor loadings of ESEM and fit indices of SEM, a three-factor model of dark personality is the most plausible one.

The cold affect facet and to some extent the interpersonal manipulation facet of the SRP-III showed unexpected factor loadings. The associations of the items in the cold affect facet were inconsistent and SEM in lavaan did not converge normally when these items were included. The cold affect facet includes items such as “I am the most important person in the world” and “I am very good at most things I try to do”. As apparent from ESEM, these items showed considerable cross-loadings on the factor which represents narcissism. This is not surprising, because content of the items is highly similar (e.g., NPI-15: “I know that I am good because everybody keeps telling me so”). I suspect that the substantial intercorrelations of the items from the cold affect facet with items from NPI-15 led to the inability of lavaan to converge normally. As Glenn and Sellbom (2014) pointed out, psychopathy questionnaires often include items which also measure facets of narcissism and Machiavellianism and furthermore they suggest that all Dark Triad traits can be summarized under the construct of psychopathy. Hare and Neumann (2008) stated, that a grandiose sense of self-worth and manipulative behaviors are part of the interpersonal manipulation facet. Therefore, it is not surprising if items operationalizing this facet show considerable cross-loadings on factors representing narcissism and Machiavellianism. However, ESEM and SEM analysis suggested separable factors and a one-factor model had considerably lower fit indices. A unification of all dark personality facets under one Dark Core (or under the construct of psychopathy) is not clearly supported by the data of the present study.

The overlap of item content might be an explanation for the high intercorrelations found between Dark Triad traits across studies (Muris et al., 2017): the traits might be distinct in their core, but are operationalized in a way that they measure other dark personality traits as well. It is for example questionable, if the item “I am very good at most things I try to do” of the SRP-III measures the cold affect facet of psychopathy and not narcissism. As Furnham et al. (2013) pointed out and I mentioned above, psychopathy scales are often designed to be broadly, to be highly inclusive and to include items measuring Machiavellianism and narcissism. The finding that intercorrelations between psychopathy/Machiavellianism and psychopathy/narcissism are the highest in Dark Triad research (Muris et al., 2017) is therefore not surprising. For future research which investigates dark personality traits with separate measures, it might be reasonable

to trim established questionnaires based on item content. This could also help to avoid multicollinearity in multiple regression and enhance differentiated understanding of associations.

Table E1 and Figure D1 display that especially items from MACH* loaded poorly on the Dark Core. This is also apparent when examining the correlations of the dark personality scales (see Table 4). To some extent, the MACH* displayed low correlations with other dark personality traits. This is not in line with previous research, which found high intercorrelations of Machiavellianism and psychopathy (Muris et al., 2017) or even suggested a two-factor model of dark personality with one factor combining psychopathy and Machiavellianism (Rogoza & Cieciuch, 2018). The low correlations found in the present study are probably due to the fact that items of the MACH* have been chosen to reflect the core of Machiavellianism and show smaller overlap with other dark personality constructs in comparison to the long form MACH-IV. Furthermore, lower correlations of the MACH* with SRP-III in comparison to the MACH-IV have already been shown (Rauthmann, 2013). The MACH* focusses on the essence of Machiavellianism which is distinct to psychopathy and narcissism. Therefore, the low intercorrelations with other scales are theoretically justifiable. The selection of measurement instruments might influence the results of structural analysis. If the MACH-IV would have been used instead of MACH* in the present study, a one-factor model representing the Dark Core might have yielded acceptable fit indices.

When investigating the factor loadings in the hierarchical Dark Core model (see Figure D5) it is noteworthy, that the latent factor grandiosity showed the highest factor loadings onto the Dark Core in SEM. Furthermore, ESEM of a one-factor model also showed higher loadings of narcissism items on the Dark Core in comparison to psychopathy and Machiavellianism items (see Table E1). This indicates that grandiosity represents the Dark Core better than other facets given the data of the present study. This is not in line with previous structural analysis of dark personality, where psychopathy scales showed the highest loadings on a Dark Core (Bertl et al., 2017; Volmer et al., 2019). However, these studies used item parcels instead of items as a basic unit. To some extent, Jonason and Webster (2010) also found higher loadings of narcissism than psychopathy items in a one-factor model when using items as a basic unit in SEM analysis. Interestingly, in the latter study, a one-factor model showed poor fit indices as well. As pointed out earlier, item parceling can conceal a multidimensional factor structure, because acceptable fit indices can be found for incorrectly specified solutions (Bandalos, 2009). When item parcels

have been used as a basic unit, a one-factor or bi-factor model displayed superior fit indices (Bertl et al., 2017; Volmer et al., 2019), when items were used as a basic unit, multidimensional models showed superior fit (Jonason & Webster, 2010; the present study). The selection of measurement instruments and the usage of item parcels seem to have influence on the factorial structure which fits best to the data. Further research, varying measurement instruments and comparing items and item parcels as a basic unit for SEM/ESEM, is needed to shed light onto the dimensional structure of dark personality.

The importance of viewing dark personality traits as distinguishable facets becomes additionally clear when regarding CFA of single questionnaires and predicting relevant outcomes in multivariate analysis. As apparent from regression analysis, the separable dark personality facets show differential relations to several outcome variables. If these facets were summarized into higher-order factors or even into one single composite scores, less nuanced interpretations of relations would have been possible.

For psychopathy, CFA suggested a three-factor model including an antisocial behavior, an interpersonal manipulation and an impulsive thrill-seeking facet or a two-factor model, including secondary and primary psychopathy. A one-factor model displayed unacceptable goodness-of-fit indicators. This is in line with theoretical assumptions about the construct of psychopathy. Individuals who are conning, manipulative and have a superficial charm (interpersonal manipulation facet), do not necessarily show poor behavioral controls, juvenile delinquency or criminal versatility (antisocial behavior facet) (Hare & Neumann, 2008). As pointed out by some authors, there is a difference in high-functioning successful psychopaths and low-functioning unsuccessful psychopaths: successful psychopaths do not display illegal antisocial behavior and deviant lifestyles and have successfully adapted themselves to society (Gao & Raine, 2010). An overall psychopathy model with only one factor, would neglect the possibility to differentiate between these different facets.

A similar picture emerges from CFA results for covert and overt narcissism. For overt narcissism a two-factor model, including a grandiosity and a leadership personality facet, displayed acceptable fit indices, except for RMSEA, and a one-factor model did not. The two-factor model replicated the factor structure found by Spangenberg et al. (2013), using EFA in a German sample. Grandiosity and leadership personality are separable facets of overt narcissism and are assumed to represent maladaptive (grandiosity) and adaptive (leadership personality)

traits (Spangenberg et al., 2013). However, differences in fit indices between the one- and two-factor model were small and as pointed out earlier, cut-offs for fit indices in SEM are only a rule of thumb (Kline, 2015). In covert narcissism, neither a two-, nor a one-factor model displayed acceptable fit indices. However, the differences of fit indices in favor of the two-factor model were so large, that the latter was preferred as a rationale for sum score computation. Furthermore, the scales of hypersensitive narcissism displayed unacceptable internal consistency. Based on data from the present study, the reliability and construct validity of the HSNS is questionable. Therefore, associations with scales from this questionnaire should be interpreted with caution.

As already pointed out by several authors (Furnham et al., 2013, 2014; Koehn, Okan, & Jonason, 2019; Rogoza & Cieciuch, 2018), the Dark Triad traits narcissism, psychopathy and Machiavellianism overlap but are most appropriately regarded as distinct constructs. The present study goes one step further and advocates the consideration of dark personality traits on a facet level to facilitate nuanced interpretations of associations. In conclusion, the view of dark personality traits as differentiated separable factors, hierarchically ordered under the construct of the Dark Triad, is supported by data from this study.

Measurement Invariance

The investigation of differences in fit indices between constrained models and likelihood ratio tests (LRT) are common methods to test for measurement invariance (Putnick & Bornstein, 2016). However, these methods were not possible in the present study because DWLS estimators have been used. This estimation method does not allow for a direct comparison between models using differences in model fit statistics or traditional chi-square difference tests (Sass, 2011). When applying standard criteria for model evaluation (Hu & Bentler, 1999) residual invariance can be assumed for groups with different educational statuses (university and no university students). In regard of the same evaluation criteria, configural invariance can be assumed for individuals with different sexes. However, because fit indices could not be directly compared and traditional LRT could not be used, these findings should be interpreted with caution. Because samples sizes were too small to conduct CFA in subgroups, item parcels have been used. It is notable, that fit indices were considerably better for the three-factor model with item parcels in comparison to the same model with items as a basic unit. This is in line with previous research, where structural analysis with item parcels yielded better fit indices in comparison to item-level

analyses (up to 0.4 points difference in CFI values in ESEM analyses) (Rogoza & Cieciuch, 2018). I followed recommendations of item parceling and tested unidimensionality of the scales before parceling was conducted (Matsunaga, 2008). However, if item parcels would have been computed differently, changes in fit indices could have resulted and interpretation would have possibly changed. More research with larger samples is needed to evaluate measurement invariance of questionnaires with items as a basic unit in Dark Triad research.

Dark personality and Mating Behavior

Dark personality, infidelity and jealousy. Infidelity experience was positively associated with impulsive thrill-seeking, antisocial behavior and leadership personality. As expected, the correlations between facets of psychopathy and infidelity experience were descriptively higher than the associations of leadership personality and infidelity experience. However, these differences were negligible small and confidence intervals overlapped. In OLS and ridge regression, antisocial behavior, leadership personality and oversensitivity were unique predictors of infidelity experience. This is in line with the results of Brewer et al. (2015), who found associations of infidelity experience, secondary psychopathy and overt narcissism. However, analysis on a facet level showed that especially antisocial behavior and not impulsive thrill-seeking was a unique predictor of infidelity experience. When OLS regression was conducted in subgroups of men and women, differential relations became apparent. In separate regression models, antisocial behavior and leadership personality were predictors of infidelity experience among men and women. However, dark personality facets explained nearly twice as much variance of infidelity experience in men than in women. Among men, leadership personality was a much stronger predictor than antisocial behavior, whereas among women, both predictors had similar regression coefficients. The previously found associations between Machiavellianism and infidelity experience (Jones & Weiser, 2014) were not replicated in the present study. This might be due to different questionnaires used: Jones and Weiser (2014) used the MACH-IV to measure Machiavellianism, which has been shown to correlate higher with psychopathy scores than the MACH* (Rauthmann, 2013). And as already pointed out, psychopathy is a solid predictor of infidelity (Brewer et al., 2015; Jones & Weiser, 2014; Timmermans et al., 2018). Therefore, the shared variance of MACH-IV and SRP in the study of Jones and Weiser (2014) might be accountable for the reported associations between Machiavellianism and infidelity. It was expected that persons who show antisocial behavior, tend

to also betray their partner. I did not expect that leadership personality, which is seen as an adaptive facet of narcissism (Spangenberg et al., 2013), was the strongest predictor in regression analysis. However, based on the questionnaires used, it is not clear if the individuals which were unfaithful, were caught by their partners. For future research, it would be interesting to examine if individuals with maladaptive dark personality facets (e.g., antisocial behavior) are more likely to get caught in unfaithful behavior than individuals with adaptive dark personality facets (e.g., leadership personality). As Jones and Weiser (2014) showed, infidelity committed by psychopathic individuals led to relationship dissolution, whereas unfaithful behavior by Machiavellian individuals did not. This might be similarly the case for individuals with high manifestations in leadership personality. Oversensitivity did not predict infidelity experience in subgroup analysis and the product-moment correlation was close to zero. I assume that oversensitivity as a unique predictor in regression was a methodological artefact due to multicollinearity.

Intention towards infidelity showed positive associations with all dark personality facets. The associations found between psychopathy, overt narcissism, Machiavellianism and intention towards infidelity are in line with previous research (Alavi et al., 2018; Brewer et al., 2015). As expected, facets of psychopathy were unique predictors of intention towards infidelity. In OLS and ridge regression, impulsive thrill-seeking, interpersonal manipulation and oversensitivity predicted intention towards infidelity significantly. As assumed, facets of psychopathy showed the highest regression coefficients. However, differences between regression coefficients were small and confidence intervals overlapped. Interestingly, antisocial facets of psychopathy were associated with being unfaithful, whereas impulsive thrill-seeking and interpersonal manipulation were related to the intention of being unfaithful. Intention towards infidelity explained 20.3 % variance of infidelity experience, which indicates a wide gap between the intention to be unfaithful and the actual behavior. Individuals who are impulsive and manipulative might report that they intend to be unfaithful, whereas antisocial individuals might actually display such behaviors. The associations of dark personality facets and intention towards infidelity differed in men and in women. Interestingly, among men, only oversensitivity, a vulnerable form of narcissism, was a unique predictor of intention towards infidelity. Men who reported to be insecure and oversensitive tended to show higher levels of intention towards infidelity. Among women, impulsive thrill-seeking and interpersonal manipulation were unique

predictors of intention towards infidelity and dark personality facets explained nearly twice as much variance of intention towards infidelity in comparison to men. Men and women might have different motives for the intention to be unfaithful. In addition, the low explained variance of intention towards infidelity in men indicates that this outcome might be better predicted by other variables than dark personality facets in this subgroup.

As assumed, facets of narcissism and psychopathy were positively related to romantic jealousy-induction. Correlations between romantic jealousy-induction and facets of psychopathy were the highest. This is in line with previous research, which found higher correlations between jealousy-induction and psychopathy than between jealousy-induction and narcissism (Jonason et al., 2010). Similar to Tortoriello et al. (2017), the present study found associations between overt and covert narcissism and jealousy-induction. It became apparent in OLS and ridge regression, that impulsive thrill-seeking, interpersonal manipulation and oversensitivity were unique predictors of romantic jealousy-induction. This is in line with previous studies, which found associations of primary and secondary psychopathy with jealousy-induction (Massar et al., 2017). However, analysis on a facet level enables a nuanced interpretation: in comparison to antisocial behavior, impulsive thrill-seeking showed significantly stronger associations with romantic jealousy-induction. Massar et al. (2017) found differential motives for jealousy-induction in primary and secondary psychopathy. Considering the results of the present study, future research might give insight into different motives for jealousy-induction between individuals with high manifestations in antisocial or impulsive thrill-seeking facets. In line with previous research (Brewer & Abell, 2015; Jonason et al., 2010), only weak associations between Machiavellianism and romantic jealousy-induction were found, which disappeared in OLS regression under inclusion of other dark personality facets. Again, differential associations in both sexes were found. In men, impulsive thrill-seeking (facet of secondary psychopathy) was the only unique predictor of romantic jealousy-induction, whereas in women interpersonal manipulation (facet of primary psychopathy) was the only unique predictor of romantic jealousy-induction. Men and women might induce jealousy out of different motives. However, more research is needed to investigate sex differences in the motives for jealousy-induction.

Cognitive jealousy was positively associated with all dark personality facets, except for leadership personality. This indicates that leadership personality can be seen as an adaptive facet of overt narcissism in comparison to grandiosity. Contrary to expectations, covert narcissism did

not display the highest correlation coefficients. In OLS and ridge regression, impulsive thrill-seeking, leadership personality, oversensitivity and Machiavellianism were unique predictors of cognitive jealousy. Again, differential relations were found in subgroup analysis. Cognitive jealousy in women was negatively associated with leadership personality and positively associated with antisocial behaviour and Machiavellianism. In men, oversensitivity and impulsive thrill-seeking were unique positive predictors of cognitive jealousy. I expected, that covert forms of narcissism show significant associations to experienced jealousy because of their relations to attachment anxiety (Besser & Priel, 2009; Brewer et al., 2018). This was found to be true for men but not for women. As Pines and Friedman (1998) argued, men might react with jealousy to protect their masculine identity, whereas women show jealousy for the protection of the relationship. Oversensitive narcissistic men might feel their masculine identity to be easier threatened and therefore experience more jealousy. However, further research is needed to investigate this hypothesis. Among women, leadership personality showed negative associations with cognitive jealousy in regression analysis. Women who have a leadership personality might be sure of themselves and their relationship and be less likely to experience jealousy.

In contrast to previous research, the present study investigated predictors on a facet level under the consideration of the shared variance of dark personality traits. The latter has the advantage that the unique predictors outlined above, are the ones most likely related to outcomes. Furthermore, I conducted ridge regression and reported product-moment correlations to secure results considering multicollinearity of predictors. As shown above, there appear to some extent large differences in the relations of dark personality facets and aspects of mating behaviour among men and women. This highlights the importance of conducting subgroup analysis when investigating mating behaviour in dark personality research. Among women, especially facets of psychopathy and leadership personality were unique predictors of outcome variables. Among men, oversensitivity seems to play a stronger role, especially in the experience of cognitive jealousy and the intention towards infidelity. Vulnerable narcissism in men, but not women seems to be associated with maladaptive behaviour. To further examine the mechanism and motives behind these associations, further research which investigates the associations including predictors on a facet level is needed.

Dark personality and attractiveness. Among men, facial attractiveness ratings of women high in Dark Triad traits were positively associated with the verbal attractiveness ratings

of women high in psychopathy. This can be seen as an indicator of the convergent validity of both measures. However, among women, facial attractiveness ratings of men high in Dark Triad traits were positively associated with verbal attractiveness ratings of men low in psychopathy. This association was not expected and indicates that attractiveness ratings using facial and verbal stimulus material might measure different subareas of attractiveness. In line with previous research (e.g., Jonason et al., 2015), participants had less interest in a long-term relationship with the person described in the high psychopathy condition in comparison to the low psychopathy condition. However, for short-term relationships no significant differences were found. Previous research found higher interest in short-term relationships for high Dark Triad descriptions (Jonason et al., 2015). Additionally, the high psychopathy condition was rated less attractive than the low psychopathy condition. This replicates findings from Qureshi et al. (2016), who used the same verbal descriptions as in the present study and found that women rated the low-scoring Dark Triad personality more favourable than the high-scoring one. Additionally, in the present study, these differences were also found in men, which indicates a general effect across both sexes. Among women, especially facets of overt narcissism were positively associated with the attractiveness ratings and interest in a short- and long-term relationship of high- and low-scoring psychopathy personalities. Facets of psychopathy were specifically associated with interest in a short-term relationship in both conditions. Narcissistic women showed generally higher ratings in all variables in both conditions, whereas psychopathic women tended to prefer high and low psychopathic personalities for short-term relationships. This is in line with previous research, which found associations of psychopathy and narcissism in women with preferences for short-term relationships (Jauk et al., 2016; Koladich & Atkinson, 2016). Dark personality facets among men were hardly associated with verbal attractiveness ratings in the high psychopathy condition. However, in the low psychopathy condition, facets of all Dark Triad traits were associated with interest in a short-term relationship. Men with high Dark Triad traits seem to prefer women who score low in psychopathy for short-term relationships. As men have hardly been studied as a population in this research area and effects found are small, further research is needed to secure findings and investigate the motives behind these preferences. In both sexes, leadership personality and impulsive thrill-seeking stand out as predictors in the high psychopathy condition. Again, motives for the interest in a relationship with a person high in psychopathy might differ. Individuals with high impulsive thrill-seeking might prefer high psychopathic

personalities just for the thrill, whereas individuals with high leadership potential might prefer these personalities out of other motives. However, more research is needed to clarify the motives for partner selection in individuals with high Dark Triad manifestations.

When using facial attractiveness ratings, women rated high Dark Triad faces of men similarly attractive as low Dark triad faces and men rated high Dark Triad faces of women slightly more attractive than low Dark Triad faces. This is not in line with previous research, which found that women were averse to high Dark Triad faces (Brewer et al., 2018; Lyons & Simeonov, 2016; Lyons et al., 2015). Among women, overt narcissism showed positive associations with ratings of high Dark Triad faces, whereas among men covert narcissism and Machiavellianism showed negative associations with ratings of high Dark Triad faces. Overt narcissism (grandiosity and leadership personality) among women showed positive relations to attractiveness ratings of men high in Dark Triad traits in facial and verbal attractiveness ratings. However, when verbal descriptions were used, overt narcissism was also positively associated with ratings in the low psychopathy condition. Female narcissists might be generally more attracted to men and live promiscuous. In a cross-cultural study, narcissists have been found to actively pursue short-term mating and display unrestricted sociosexuality (Schmitt et al., 2017). Furthermore, this is in line with assumptions of the LHT: high Dark Triad individuals tend to have a fast life strategy (McDonald et al., 2012) and show positive preferences for short-term mating (Jonason et al., 2009). To my interest the present study indicates, that women high in the Dark Triad find men more attractive independent on the darkness of their potential partner's personality, whereas men high in Dark Triad traits prefer only women with low dark personality traits. However, effects found are small and further research is needed to investigate the relations of mating strategies and attractiveness ratings in dark personality research.

Limitations

I used self-report questionnaires to operationalize psychological constructs. Especially survey questions asking about sensitive issues like illegal behavior tend to generate biased results due to distortions by social desirability (Krumpal, 2013). I do not know how genuine participants have answered the questions and it is notable that the scales with the most missing data were the most sensitive and intimate ones (infidelity experience and intention towards infidelity). Even as Little's MCAR's test was not significant, it is still possible that data was not missing completely at random and validity of results might therefore be limited. Furthermore, unidimensionality is a

requirement to compute a composite score (Slocum-Gori & Zumbo, 2011). Some of the fit indices in SEM analysis were lower than recommended cut-offs for adequate model fit. If these cut-offs were strictly applied, it would have not been justified to compute composite scores for scales of covert, overt narcissism, intention towards infidelity, and cognitive jealousy. Because these cut-offs are only a rule of thumb, I computed composite scores nevertheless. As a general limitation for interpretation of SEM results, I have to point out that standard cut-off values for evaluation of model fit were applied, which were originally developed under normal-theory ML (Hu & Bentler, 1999). In a recent study, DWLS estimator have been found to underestimate RMSEA and overestimate CFI and TLI values (Xia & Yang, 2019). Therefore, the fit indices of SEM models should be interpreted with caution. I decided to use the DWLS estimator nevertheless, because it has been shown to be more accurate than ML estimation under non-normal and categorical data (Mîndrilă, 2016).

Differential relations of dark personality facets and aspects of mating behavior among men and women were investigated using separate regression models in both subgroups. This procedure revealed heterogeneous unique predictors between sexes. However, due to the methodology used it is not clear, if differences between the predictors are significant. Furthermore, analyses of dark personality traits and their associations to aspects of mating behavior have partly been conducted exploratory because previous literature has not examined these associations on a facet level. Therefore, multiple testing correction has not been conducted (Ranstam, 2016). However, due to the large number of statistical tests conducted, some significant associations found might be due to chance. Further research is needed to secure findings of the present study. Additionally, random sampling has not been conducted and strictly speaking, the validity of results from inferential statistics is therefore questionable.

Implications

This study emphasizes a three-factorial structure of dark personality traits and the importance of examining associations with outcomes on a facet level in dark personality research. As shown above, dark personality facets show differential relations with outcomes and facilitate nuanced interpretations of associations found. Furthermore, subgroup analysis in the research area of mating behavior is especially important to determine differential patterns in sexes. In addition, researcher degrees of freedom in structural analysis (e.g., selection of questionnaires, computation of item parcels and choice of estimator) largely influence factorial

structures found which fit best to the data. I advocate the importance of using items as a basic unit, selecting appropriate estimators and providing factor loadings for transparency. This study showed unique predictors of infidelity and jealousy under consideration of the shared variance of dark personality traits. Furthermore, the results give researchers the fundament to examine the motives behind partner selection and mating behavior in dark personality research.

References

- Alavi, M., Kye Mei, T., & Mehrinezhad, S. A. (2018). The Dark Triad of personality and infidelity intentions: The moderating role of relationship experience. *Personality and Individual Differences, 128*, 49–54. doi:10.1016/j.paid.2018.02.023
- Ames, D. R., Rose, P., & Anderson, C. P. (2006). The NPI-16 as a short measure of narcissism. *Journal of Research in Personality, 40*, 440–450. doi:10.1016/j.jrp.2005.03.002
- Asparouhov, T., & Muthén, B. (2009). Exploratory Structural Equation Modeling. *Structural Equation Modeling, 16*, 397–438. doi:10.1080/10705510903008204
- Bandalos, D. L. (2009). The Effects of Item Parceling on Goodness-of-Fit and Parameter Estimate Bias in Structural Equation Modeling. *Structural Equation Modeling, 9*, 78–102. doi:10.1207/S15328007SEM0901_5
- Bandalos, D. L. (2014). Relative Performance of Categorical Diagonally Weighted Least Squares and Robust Maximum Likelihood Estimation. *Structural Equation Modeling, 21*, 102–116. doi:10.1080/10705511.2014.859510
- Barelids, D. P. H., Dijkstra, P., Groothof, H. A. K., & Pastoor, C. D. (2017). The Dark Triad and three types of jealousy: Its' relations among heterosexuals and homosexuals involved in a romantic relationship. *Personality and Individual Differences, 116*, 6–10. doi:10.1016/j.paid.2017.04.017
- Bertl, B., Pietschnig, J., Tran, U. S., Stieger, S., & Voracek, M. (2017). More or less than the sum of its parts? Mapping the Dark Triad of personality onto a single Dark Core. *Personality and Individual Differences, 114*, 140–144. doi:10.1016/j.paid.2017.04.002
- Besser, A., & Priel, B. (2009). Emotional Responses to a Romantic Partner's Imaginary Rejection: The Roles of Attachment Anxiety, Covert Narcissism, and Self-Evaluation. *Journal of Personality, 77*, 287–325. doi:10.1111/j.1467-6494.2008.00546.x
- Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quinonez, H. R., & Young, S. L. (2018). Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. *Frontiers in Public Health, 6*, 1–18. doi:10.3389/fpubh.2018.00149
- Bonomi, A. E., Altenburger, L. E., & Walton, N. L. (2013). “Double Crap!” Abuse and Harmed Identity in Fifty Shades of Grey. *Journal of Women's Health, 22*, 733–744. doi:10.1089/jwh.2013.4344

- Brewer, G., & Abell, L. (2015). Machiavellianism in long-term relationships: Competition, mate retention and sexual coercion. *Scandinavian Journal of Psychology*, 56, 357–362. doi:10.1111/sjop.12200
- Brewer, G., Bennett, C., Davidson, L., Ireen, A., Phipps, A. J., Stewart-Wilkes, D., & Wilson, B. (2018). Dark triad traits and romantic relationship attachment, accommodation, and control. *Personality and Individual Differences*, 120, 202–208. doi:10.1016/j.paid.2017.09.008
- Brewer, G., Carter, G. L., Lyons, M., & Green, J. (2018). Sensation-seeking in women does not affect their preference for Dark Triad male faces. *Personality and Individual Differences*, 130, 92–95. doi:10.1016/j.paid.2018.03.051
- Brewer, G., Hunt, D., James, G., & Abell, L. (2015). Dark Triad traits, infidelity and romantic revenge. *Personality and Individual Differences*, 83, 122–127. doi:10.1016/j.paid.2015.04.007
- Burchell, J. L., & Ward, J. (2011). Sex drive, attachment style, relationship status and previous infidelity as predictors of sex differences in romantic jealousy. *Personality and Individual Differences*, 51, 657–661. doi:10.1016/j.paid.2011.06.002
- Buunk, B. P. (1997). Birth Order and Attachment As Related To Various Types of Jealousy. *Personality and Individual Differences*, 23, 997–1006. doi:10.1016/s0191-8869(97)00136-0
- Carter, G. L., Campbell, A. C., & Muncer, S. (2014). The dark triad personality: Attractiveness to women. *Personality and Individual Differences*, 56, 57–61. doi:10.1016/j.paid.2013.08.021
- Chen, G. J. (2012). A simple way to deal with multicollinearity. *Journal of Applied Statistics*, 39, 1893–1909. doi:10.1080/02664763.2012.690857
- Chin, K., Atkinson, B. E., Raheb, H., Harris, E., & Vernon, P. A. (2017). The dark side of romantic jealousy. *Personality and Individual Differences*, 115, 23–29. doi:10.1016/j.paid.2016.10.003
- Chiorri, C., Garofalo, C., & Velotti, P. (2019). Does the Dark Triad Manifest Similarly in men and Women? Measurement Invariance of the Dirty Dozen across sex. *Current Psychology*, 38, 659–675. doi:10.1007/s12144-017-9641-5
- Chong, I. G., & Jun, C. H. (2005). Performance of some variable selection methods when multicollinearity is present. *Chemometrics and Intelligent Laboratory Systems*, 78, 103–112. doi:10.1016/j.chemolab.2004.12.011
- Christie, R., & Geis, F. (Eds.). (1970). *Studies in Machiavellianism* (1st ed.). New York:

- Academic Press. doi:10.1016/B978-0-12-174450-2.50001-4
- Curtis, S. M., & Ghosh, S. K. (2011). A Bayesian Approach to Multicollinearity and the Simultaneous Selection and Clustering of Predictors in Linear Regression. *Journal of Statistical Theory and Practice*, 5, 715–735. doi:10.1080/15598608.2011.10483741
- Darr, W., & Kelloway, E. K. (2016). Sifting the Big Five: examining the criterion-related validity of facets. *Journal of Organizational Effectiveness: People and Performance*, 3, 2–22. doi:10.1108/joepp-11-2015-0038
- Distefano, C., Zhu, M., & Mîndrilă, D. (2009). Understanding and Using Factor Scores: Considerations for the Applied Researcher. *Practical Assessment, Research & Evaluation*, 14, 1–11.
- Dotterer, H. L., Waller, R., Neumann, C. S., Shaw, D. S., Forbes, E. E., Hariri, A. R., & Hyde, L. W. (2017). Examining the Factor Structure of the Self-Report of Psychopathy Short-Form Across Four Young Adult Samples. *Assessment*, 24, 1062–1079. doi:10.1177/1073191116640355
- Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British Journal of Psychology*, 105, 399–412. doi:10.1111/bjop.12046
- Duzan, H., & Shariff, N. S. B. M. (2015). Ridge Regression for Solving the Multicollinearity Problem: Review of Methods and Models. *Journal of Applied Sciences*, 15, 392–404. doi:10.3923/jas.2015.392.404
- Egan, V., Hughes, N., & Palmer, E. J. (2015). Moral disengagement, the dark triad, and unethical consumer attitudes. *Personality and Individual Differences*, 76, 123–128. doi:10.1016/j.paid.2014.11.054
- Ellis, H. (1898). Auto-Erotism: a Psychological Study. *Alienist and Neurologist*, 19, 260.
- Farrar, D. E., & Glauber, R. R. (1967). Multicollinearity in Regression Analysis: The Problem Revisited. *The Review of Economics and Statistics*, 49, 92–107. doi:10.2307/1937887
- Feldt, R. C., Lee, J., & Dew, D. (2014). Criterion Validity of Facets versus Domains of the Big Five Inventory. *Individual Differences Research*, 12, 112–122.
- Field, A. (2013). *Discovering Statistics using IBM SPSS Statistics*. Los Angeles: SAGE Publications.
- Figueredo, A. J., Cabeza de Baca, T., & Woodley, M. A. (2013). The measurement of human life

- history strategy. *Personality and Individual Differences*, 55, 251–255.
doi:10.1016/j.paid.2012.04.033
- Fossati, A., Borroni, S., Grazioli, F., Dornetti, L., Marcassoli, I., Maffei, C., & Cheek, J. (2009). Tracking the hypersensitive dimension in narcissism: Reliability and validity of the Hypersensitive Narcissism Scale. *Personality and Mental Health*, 3, 235–247.
doi:10.1002/pmh.92
- Furnham, A., Richards, S. C., & Paulhus, D. L. (2013). The Dark Triad of Personality: A 10 Year Review. *Social and Personality Psychology Compass*, 7, 199–216. doi:10.1111/spc3.12018
- Furnham, A., Richards, S., Rangel, L., & Jones, D. N. (2014). Measuring malevolence: Quantitative issues surrounding the Dark Triad of personality. *Personality and Individual Differences*, 67, 114–121. doi:10.1016/j.paid.2014.02.001
- Gadermann, A. M., Guhn, M., & Zumbo, B. D. (2012). Estimating ordinal reliability for Likert-type and ordinal item response data: A conceptual, empirical, and practical guide. *Practical Assessment, Research & Evaluation*, 17.
- Gao, Y., & Raine, A. (2010). Successful and Unsuccessful Psychopaths: A Neurobiological Model. *Behavioral Sciences and the Law*, 28, 194–210. doi:10.1002/bsl.924
- Glenn, A. L., & Sellbom, M. (2014). Theoretical and Empirical Concerns Regarding the Dark Triad as a Construct. *Journal of Personality Disorders*, 29, 360–377.
doi:10.1521/pedi_2014_28_162
- Golub, G. H., Heath, M., & Wahba, G. (1979). Generalized Cross-Validation as a Method for Choosing a Good Ridge Parameter. *Technometrics*, 21, 215–223.
doi:10.1080/00401706.1979.10489751
- Goodboy, A. K., Horan, S. M., & Booth-Butterfield, M. (2012). Intentional Jealousy-Evoking Behavior in Romantic Relationships as a Function of Received Partner Affection and Love Styles. *Communication Quarterly*, 60, 370–385. doi:10.1080/01463373.2012.688792
- Hanel, P. H. P., & Vione, K. C. (2016). Do Student Samples Provide an Accurate Estimate of the General Public? *PLoS ONE*, 11, 1–10. doi:10.1371/journal.pone.0168354
- Hare, R. D. (1985). Comparison of procedures for the assessment of psychopathy. *Journal of Consulting and Clinical Psychology*, 53, 7–16. doi:10.1037/0022-006x.53.1.7
- Hare, R. D. (1991). *The Psychopathy Checklist-Revised (PCL-R)*. North Tonawanda: Multi-Health Systems, Incorporated.

- Hare, R. D., & Neumann, C. S. (2008). Psychopathy as a Clinical and Empirical Construct. *Annual Review of Clinical Psychology, 4*, 217–246.
doi:10.1146/annurev.clinpsy.3.022806.091452
- Hendin, H. M., & Cheek, J. M. (1997). Assessing Hypersensitive Narcissism: A Reexamination of Murray's Narcism Scale. *Journal of Research in Personality, 31*, 588–599.
doi:10.1006/jrpe.1997.2204
- Holtzman, N. S. (2011). Facing a psychopath: Detecting the dark triad from emotionally-neutral faces, using prototypes from the Personality Faceaurus. *Journal of Research in Personality, 45*, 648–654. doi:10.1016/j.jrp.2011.09.002
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.
doi:10.1080/10705519909540118
- Jauk, E., Neubauer, A. C., Mairunteregger, T., Pemp, S., Sieber, K. P., & Rauthmann, J. F. (2016). How Alluring Are Dark Personalities? The Dark Triad and Attractiveness in Speed Dating. *European Journal of Personality, 30*, 125–138. doi:10.1002/per.2040
- Jonason, P. K., & Kavanagh, P. (2010). The dark side of love: Love styles and the Dark Triad. *Personality and Individual Differences, 49*, 606–610. doi:10.1016/j.paid.2010.05.030
- Jonason, P. K., Li, N. P., & Buss, D. M. (2010). The costs and benefits of the Dark Triad: Implications for mate poaching and mate retention tactics. *Personality and Individual Differences, 48*, 373–378. doi:10.1016/j.paid.2009.11.003
- Jonason, P. K., Li, N. P., Webster, G. D., & Schmitt, D. P. (2009). The Dark Triad: Facilitating a Short-Term Mating Strategy in Men. *European Journal of Personality, 23*, 5–18.
doi:10.1002/per.698
- Jonason, P. K., Lyons, M., & Blanchard, A. (2015). Birds of a “bad” feather flock together: The Dark Triad and mate choice. *Personality and Individual Differences, 78*, 34–38.
doi:10.1016/j.paid.2015.01.018
- Jonason, P. K., & Webster, G. D. (2010). The dirty dozen: A concise measure of the dark triad. *Psychological Assessment, 22*, 420–432. doi:10.1037/a0019265
- Jones, D. N., & Weiser, D. A. (2014). Differential infidelity patterns among the Dark Triad. *Personality and Individual Differences, 57*, 20–24. doi:10.1016/j.paid.2013.09.007
- Jones, N. L., Olderbak, S. G., & Figueredo, A. J. (2013). The Intentions Towards Infidelity Scale.

- In T. D. Fisher, C. M. Davis, W. L. Yarber, & S. L. Davis (Eds.), *Handbook of Sexuality-Related Measures* (3rd ed., pp. 251–253). New York: Routledge.
- Kinsey, A., Pomeroy, W., & Martin, C. (1948). *Sexual Behaviour in the Human Male*. Philadelphia, PA: Saunders.
- Kline, R. B. (2015). *Principles and practice of structural equation modeling*. New York: Guilford publications.
- Koehn, M. A., Okan, C., & Jonason, P. K. (2019). A primer on the Dark Triad traits. *Australian Journal of Psychology*, 71, 7–15. doi:10.1111/ajpy.12198
- Koladich, S. J., & Atkinson, B. E. (2016). The dark triad and relationship preferences: A replication and extension. *Personality and Individual Differences*, 94, 253–255. doi:10.1016/j.paid.2016.01.023
- Kranz, F., & Ishai, A. (2006). Face Perception is Modulated by Sexual Preference. *Current Biology*, 16, 63–68. doi:10.1016/j.cub.2005.10.070
- Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: A literature review. *Quality and Quantity*, 47, 2025–2047. doi:10.1007/s11135-011-9640-9
- Kubarych, T. S., Deary, I. J., & Austin, E. J. (2004). The Narcissistic Personality Inventory: Factor structure in a non-clinical sample. *Personality and Individual Differences*, 36, 857–872. doi:10.1016/S0191-8869(03)00158-2
- Küfner, A. C. P., Dufner, M., & Back, M. D. (2014). Das Dreckige Dutzend und die Niederträchtigen Neun: Kurzskalen zur Erfassung von Narzissmus, Machiavellismus und Psychopathie. *Diagnostica*, 61, 76–91. doi:10.1026/0012-1924/a000124
- Lyons, M., & Simeonov, L. (2016). The undesirable Dark Triad? Women dislike Dark Triad male faces across different mating context and socio-ecological conditions. *Personality and Individual Differences*, 90, 338–341. doi:10.1016/j.paid.2015.11.047
- Lyons, M. T., Marcinkowska, U. M., Helle, S., & McGrath, L. (2015). Mirror, mirror, on the wall, who is the most masculine of them all? The Dark Triad, masculinity, and women's mate choice. *Personality and Individual Differences*, 74, 153–158. doi:10.1016/j.paid.2014.10.020
- Marcinkowska, U. M., Helle, S., & Lyons, M. (2015). Dark traits: Sometimes hot, and sometimes not? Female preferences for Dark Triad faces depend on sociosexuality and contraceptive use. *Personality and Individual Differences*, 86, 369–373.

doi:10.1016/j.paid.2015.06.030

- Massar, K., Winters, C. L., Lenz, S., & Jonason, P. K. (2017). Green-eyed snakes: The associations between psychopathy, jealousy, and jealousy induction. *Personality and Individual Differences, 115*, 164–168. doi:10.1016/j.paid.2016.01.055
- Matsunaga, M. (2008). Item Parceling in Structural Equation Modeling: A Primer. *Communication Methods and Measures, 2*, 260–293. doi:10.1080/19312450802458935
- Mattingly, B. A., Whitson, D., & Mattingly, M. J. B. (2012). Development of the Romantic Jealousy-Induction Scale and the Motives for Inducing Romantic Jealousy Scale. *Current Psychology, 31*, 263–281. doi:10.1007/s12144-012-9144-3
- McDonald, M. M., Donnellan, M. B., & Navarrete, C. D. (2012). A life history approach to understanding the Dark Triad. *Personality and Individual Differences, 52*, 601–605. doi:10.1016/j.paid.2011.12.003
- Mîndrilă, D. (2016). Maximum Likelihood (ML) and Diagonally Weighted Least Squares (DWLS) Estimation Procedures: A Comparison of Estimation Bias with Ordinal and Multivariate Non-Normal Data. *International Journal for Digital Society, 1*, 60–66. doi:10.20533/ijds.2040.2570.2010.0010
- Muris, P., Merckelbach, H., Otgaar, H., & Meijer, E. (2017). The Malevolent Side of Human Nature: A Meta-Analysis and Critical Review of the Literature on the Dark Triad (Narcissism, Machiavellianism, and Psychopathy). *Perspectives on Psychological Science, 12*, 183–204. doi:10.1177/1745691616666070
- Murphy, L., & Guilkey, D. K. (1975). Directed Ridge Regression Techniques in Cases of Multicollinearity. *Journal of the American Statistical Association, 70*, 769–775.
- Muthén, L. K., & Muthén, B. O. (n.d.). *Mplus User's Guide* (Eighth Ed.). Los Angeles, CA: Muthén & Muthén.
- Neal, T. M. S., & Sellbom, M. (2012). Examining the Factor Structure of the Hare Self-Report Psychopathy Scale. *Journal of Personality Assessment, 94*, 244–253. doi:10.1080/00223891.2011.648294
- Paulhus, D. L., & Williams, K. M. (2002). The Dark Triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality, 36*, 556–563. doi:10.1016/S0092-6566(02)00505-6
- Peterson, R. A. (2001). On the Use of College Students in Social Science Research: Insights

- from a Second-Order Meta-analysis. *Journal of Consumer Research*, 28, 450–461.
doi:10.1086/323732
- Pfeiffer, S. M., & Wong, P. T. P. (1989). Multidimensional Jealousy. *Journal of Social and Personal Relationships*, 6, 181–196. doi:10.1177/026540758900600203
- Pines, A. M., & Friedman, A. (1998). Gender Differences in Romantic Jealousy. *Journal of Social Psychology*, 138, 54–71. doi:10.1080/00224549809600353
- Preotiuc-Pietro, D., Carpenter, J., Giorgi, S., & Ungar, L. (2016). Studying the Dark Triad of Personality through Twitter Behavior. In *Proceedings of the 25th ACM International on Conference on Information and Knowledge Management* (pp. 761–770).
doi:10.1145/2983323.2983822
- Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, 41, 71–90. doi:10.1016/j.dr.2016.06.004
- Qureshi, C., Harris, E., & Atkinson, B. E. (2016). Relationships between age of females and attraction to the Dark Triad personality. *Personality and Individual Differences*, 95, 200–203. doi:10.1016/j.paid.2016.02.047
- Ranstam, J. (2016). Multiple P-values and Bonferroni correction. *Osteoarthritis and Cartilage*, 24, 763–764. doi:10.1016/j.joca.2016.01.008
- Raskin, R. N., & Hall, C. S. (1979). A narcissistic personality inventory. *Psychological Reports*, 45, 590. doi:10.2466/pr0.1979.45.2.590
- Rauthmann, J. F. (2013). Investigating the MACH-IV With Item Response Theory and Proposing the Trimmed MACH. *Journal of Personality Assessment*, 95, 1–10.
doi:10.1080/00223891.2012.742905
- Rogoza, R., & Cieciuch, J. (2018). Dark Triad traits and their structure: An empirical approach. *Current Psychology*, 1–16. doi:10.1007/s12144-018-9834-6
- Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, 48, 1–36. doi:10.18637/jss.v048.i02
- RStudio Team. (2015). RStudio: Integrated development environment for R. Boston, MA: RStudio, Inc. Retrieved from <http://www.rstudio.com/>.
- Rushton, J. P. (1985). Differential K theory: The sociobiology of individual and group differences. *Personality and Individual Differences*, 6, 441–452. doi:10.1016/0191-

8869(85)90137-0

- Sass, D. A. (2011). Testing Measurement Invariance and Comparing Latent Factor Means Within a Confirmatory Factor Analysis Framework. *Journal of Psychoeducational Assessment*, 29, 347–363. doi:10.1177/0734282911406661
- Schmitt, D. P., Alcalay, L., Simonetti, F., Allik, J., Schmidt, M., Ferreira, J. H. B. P., ... Hajdú, E. (2017). Narcissism and the Strategic Pursuit of Short-Term Mating: Universal Links across 11 World Regions of the International Sexuality Description Project-2. *Psychological Topics*, 26, 89–137. doi:10.31820/pt.26.1.5
- Schütz, A., Marcus, B., & Sellin, I. (2004). Die Messung von Narzissmus als Persönlichkeitskonstrukt. *Diagnostica*, 50, 202–218. doi:10.1026/0012-1924.50.4.202
- Sijtsma, K. (2009). On the Use, the Misuse, and the Very Limited Usefulness of Cronbach's Alpha. *Psychometrika*, 74, 107–120. doi:10.1007/s11336-008-9101-0
- Sleep, C. E., Lynam, D. R., Hyatt, C. S., & Miller, J. D. (2017). Perils of partialing redux: The Case of the Dark Triad. *Journal of Abnormal Psychology*, 126, 939–950. doi:10.1037/abn0000278
- Slocum-Gori, S. L., & Zumbo, B. D. (2011). Assessing the Unidimensionality of Psychological Scales: Using Multiple Criteria from Factor Analysis. *Social Indicators Research*, 102, 443–461. doi:10.1007/s11205-010-9682-8
- Smith, C. V., Øverup, C. S., & Webster, G. D. (2019). Sexy deeds done dark? Examining the relationship between dark personality traits and sexual motivation. *Personality and Individual Differences*, 146, 105–110. doi:10.1016/j.paid.2019.04.003
- Spangenberg, L., Romppel, M., Bormann, B., Hofmeister, D., Brähler, E., & Strauss, B. (2013). Psychometrische Überprüfung einer Kurzform des Narcissistic Personality Inventory (NPI-15): Dimensionalität und psychometrische Eigenschaften des NPI-15 in einer repräsentativen Bevölkerungsstichprobe. *PPmP - Psychotherapie · Psychosomatik · Medizinische Psychologie*, 341–347. doi:10.1055/s-0032-1333288
- Timmermans, E., De Caluwé, E., & Alexopoulos, C. (2018). Why are you cheating on tinder? Exploring users' motives and (dark) personality traits. *Computers in Human Behavior*, 89, 129–139. doi:10.1016/j.chb.2018.07.040
- Tortoriello, G. K., Hart, W., Richardson, K., & Tullett, A. M. (2017). Do narcissists try to make romantic partners jealous on purpose? An examination of motives for deliberate jealousy-

- induction among subtypes of narcissism. *Personality and Individual Differences*, 114, 10–15. doi:10.1016/j.paid.2017.03.052
- Trizano-Hermosilla, I., & Alvarado, J. M. (2016). Best Alternatives to Cronbach's Alpha Reliability in Realistic Conditions: Congeneric and Asymmetrical Measurements. *Frontiers in Psychology*, 7, 1–8. doi:10.3389/fpsyg.2016.00769
- Ullah, Muhammad, I., Aslam, M., & Altaf, S. (2018). lmrige: A Comprehensive R Package for Ridge Regression. *The R Journal*, 10, 326–346. doi:10.32614/rj-2018-060
- Veselka, L., Giammarco, E. A., & Vernon, P. A. (2014). The Dark Triad and the seven deadly sins. *Personality and Individual Differences*, 67, 75–80. doi:10.1016/j.paid.2014.01.055
- Volmer, J., Koch, I. K., & Wolff, C. (2019). Illuminating the 'dark core': Mapping global versus specific sources of variance across multiple measures of the dark triad. *Personality and Individual Differences*, 145, 97–102. doi:10.1016/j.paid.2019.03.024
- Xia, Y., & Yang, Y. (2018). The Influence of Number of Categories and Threshold Values on Fit Indices in Structural Equation Modeling with Ordered Categorical Data. *Multivariate Behavioral Research*, 53, 731–755. doi:10.1080/00273171.2018.1480346
- Xia, Y., & Yang, Y. (2019). RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods*, 51, 409–428. doi:10.3758/s13428-018-1055-2
- Yakeley, J. (2018). Current understanding of narcissism and narcissistic personality disorder. *BJPsych Advances*, 24, 305–315. doi:10.1192/bja.2018.20
- Zhang, J., & Ibrahim, M. (2005). A simulation study on SPSS ridge regression and ordinary least squares regression procedures for multicollinearity data. *Journal of Applied Statistics*, 32, 571–588. doi:10.1080/02664760500078946
- Ziegler, M., & Hagemann, D. (2015). Testing the Unidimensionality of Items: Pitfalls and Loopholes. *European Journal of Psychological Assessment*, 31, 231–237. doi:10.1027/1015-5759/a000309

Appendix A

German Translations of Self-descriptions representing low/high Dark Triad

Manifestations

Low psychopathy description: “Ich genieße es, mit verschiedenen Leuten meiner Umgebung Bekanntschaft zu machen; manche besitzen diese reizvolle Stärke, die mein Interesse weckt. Die Persönlichkeit anderer Leute und ihre Leistungen interessieren mich sehr. Es ist immer schön, zu bewundern, wozu andere Leute in der Lage sind. In einer Beziehung tendiere ich dazu, meinem Partner die Führung zu überlassen; besonders, wenn es um die Planung eines ruhigen Abends geht (ich mag die Stabilität und Behaglichkeit, die meine Beziehungen mit sich bringen).”

High psychopathy description: „Ich genieße es, mit verschiedenen Leuten meiner Umgebung Bekanntschaft zu machen; manche tragen diese reizvolle Verletzlichkeit in sich, die mein Interesse weckt. Ich mag es, wenn sich Leute für mich und meine Leistungen interessieren; es ist immer schön, wenn man geschätzt und bewundert wird für das, was man tut. In einer Beziehung tendiere ich dazu, die Rolle des Entscheidungsträgers zu übernehmen; besonders, wenn es darum geht, meinen Partner extravagant auszuführen (in einer Beziehung bin ich gerne impulsiv).“

Appendix B

Dimensionality of Questionnaires

Narcissism

The factor-structure found by Spangenberg et al. (2013) was replicated using a confirmatory framework and yielded, except for RMSEA, an acceptable fit ($\chi^2(89) = 463.890$, $p < 0.001$; RMSEA = 0.077; SRMR = 0.079; CFI = 0.972; TLI = 0.966). The fit indices of the two-factor model were only slightly superior to a one-factor model ($\chi^2(90) = 541.239$, $p < 0.001$; RMSEA = 0.084; SRMR = 0.085; CFI = 0.966; TLI = 0.960). However, grandiosity and leadership personality are theoretically separable facets of overt narcissism and might be differently related to outcome variables. Therefore, weighted sum scores were computed for grandiosity and leadership personality. For hypersensitive narcissism, a two-factor model with an oversensitivity and egocentrism facet (Fossati et al., 2009), yielded superior, but unacceptable, fit indices ($\chi^2(34) = 194.086$, $p < 0.001$; RMSEA = 0.081; SRMR = 0.074; CFI = 0.855; TLI = 0.808) in comparison to a one-factor model ($\chi^2(35) = 331.729$, $p < 0.001$; RMSEA = 0.109; SRMR = 0.100; CFI = 0.732; TLI = 0.655). Weighted sum scores were computed for oversensitivity and egocentrism.

Machiavellianism

For Machiavellianism, a one-factor model yielded acceptable fit indices ($\chi^2(5) = 13.256$, $p = .021$; RMSEA = 0.048; SRMR = 0.039; CFI = 0.992; TLI = 0.985).

Psychopathy

The factor structure of the Self-Report Psychopathy scale proposed by Hare and Neumann (2008) yielded acceptable fit indices ($\chi^2(428) = 959.027$, $p < .001$; RMSEA = 0.042; SRMR = 0.064; CFI = 0.952; TLI = 0.948). However, the covariance matrix of latent variables was not found to be positive definite, which was mainly due to variables in the cold affect facet. When removing all five items from this facet and the latent variable, the model converged normally and yielded acceptable fit indices ($\chi^2(296) = 639.450$, $p < .001$; RMSEA = 0.040; SRMR = 0.064; CFI = 0.965; TLI = 0.962). A one-factor model ($\chi^2(299) = 810.428$, $p < .001$; RMSEA = 0.049; SRMR = 0.072; CFI = 0.948; TLI = 0.934) showed unacceptable goodness-of-fit indicators. A two-factor model (including primary and secondary psychopathy) showed acceptable fit indices ($\chi^2(298) = 735.521$, $p < .001$; RMSEA = 0.045; SRMR = 0.070; CFI = 0.956; TLI = 0.952). The aim of this study is to address associations of dark personality facets,

which have not been investigated in previous studies. Therefore, I computed weighted sum scores for the impulsive thrill-seeking, interpersonal manipulation and antisocial facet of psychopathy.

Appendix C

Evaluation of Assumptions for Multiple Linear OLS Regression

Multicollinearity

VIF and tolerance statistics were used to evaluate multicollinearity. Following standard recommendations of model evaluation, the subsequent values were used as cut-offs for problematic multicollinearity: $VIF > 10$ and $tolerance < 0.2$ (Field, 2013). VIF and tolerance indicated no problematic multicollinearity. However to some extent, correlations between independent variables were moderately high. Table 4 displays Pearson product-moment correlations of all main variables.

Homoscedasticity

Graphical analysis using scatter plots of standardized predicted values and standardized residuals were used to evaluate homoscedasticity (Field, 2013). Graphical analysis indicated no heteroscedasticity.

Normally Distributed Errors

Graphical analysis using histograms and probability-probability (P-P) plots of standardized residuals were used to evaluate the normal distribution of errors (Field, 2013). Histograms and P-P plots indicated normally distributed standardized residuals for the models predicting cognitive jealousy and intention towards infidelity. Graphical analysis indicated non-normal distributions of errors in the models predicting romantic jealousy-induction and infidelity experience. Therefore, I secured results using ridge regression.

Linearity

Partial plots were used to investigate linearity (Field, 2013). All variables used in regression analysis showed linear associations.

Appendix D

Path Diagrams of Confirmatory Factor Analyses

Path diagram of confirmatory factor analysis for one-factor model

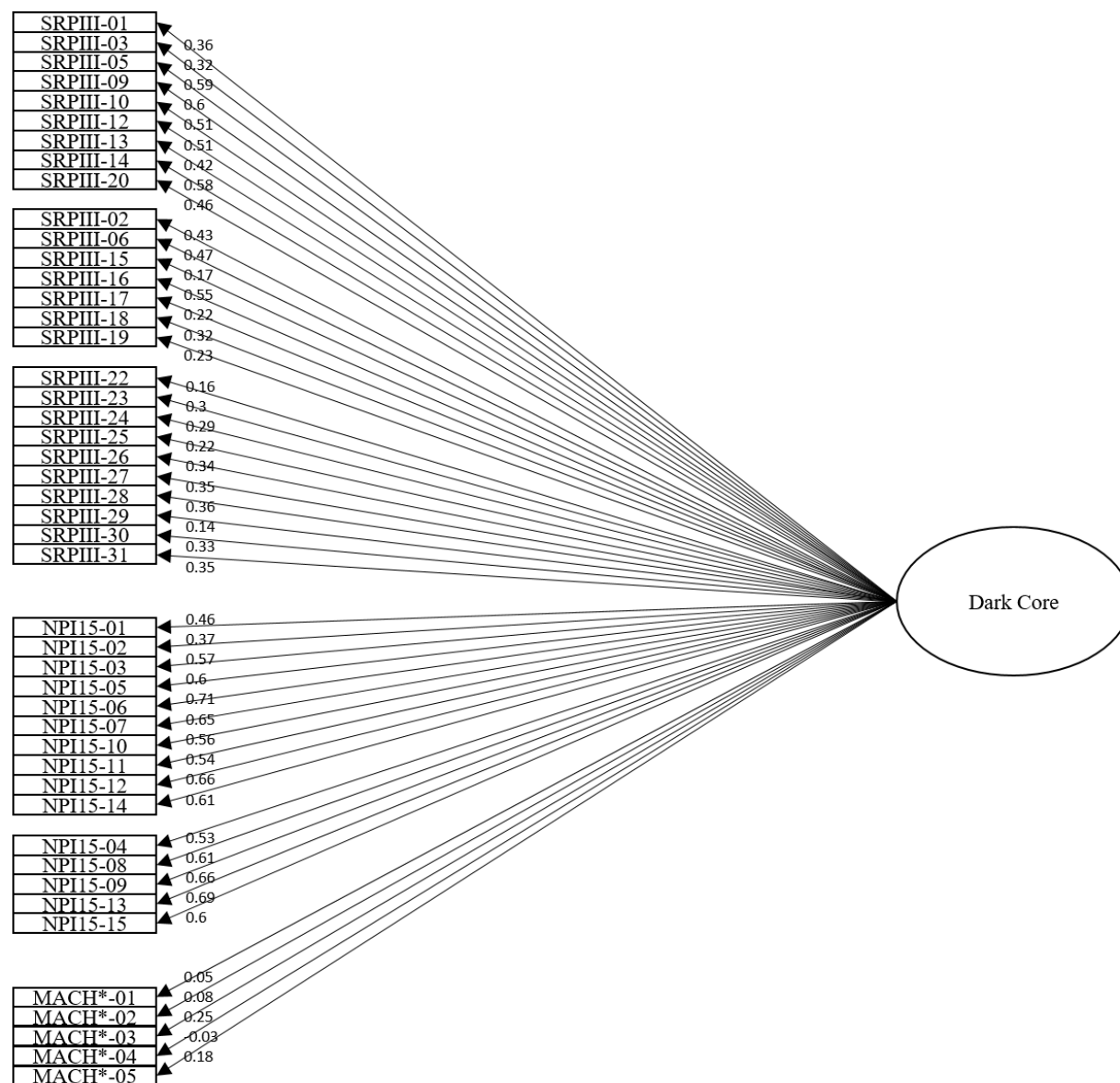


Figure D1. Structural equation model of the Dark Core. Standardized factor loadings are presented. DWLS estimator used. SRPIII = psychopathy measure; NPI = narcissism measure; MACH* = Machiavellianism measure.

Path diagram of confirmatory factor analysis for three-factor model

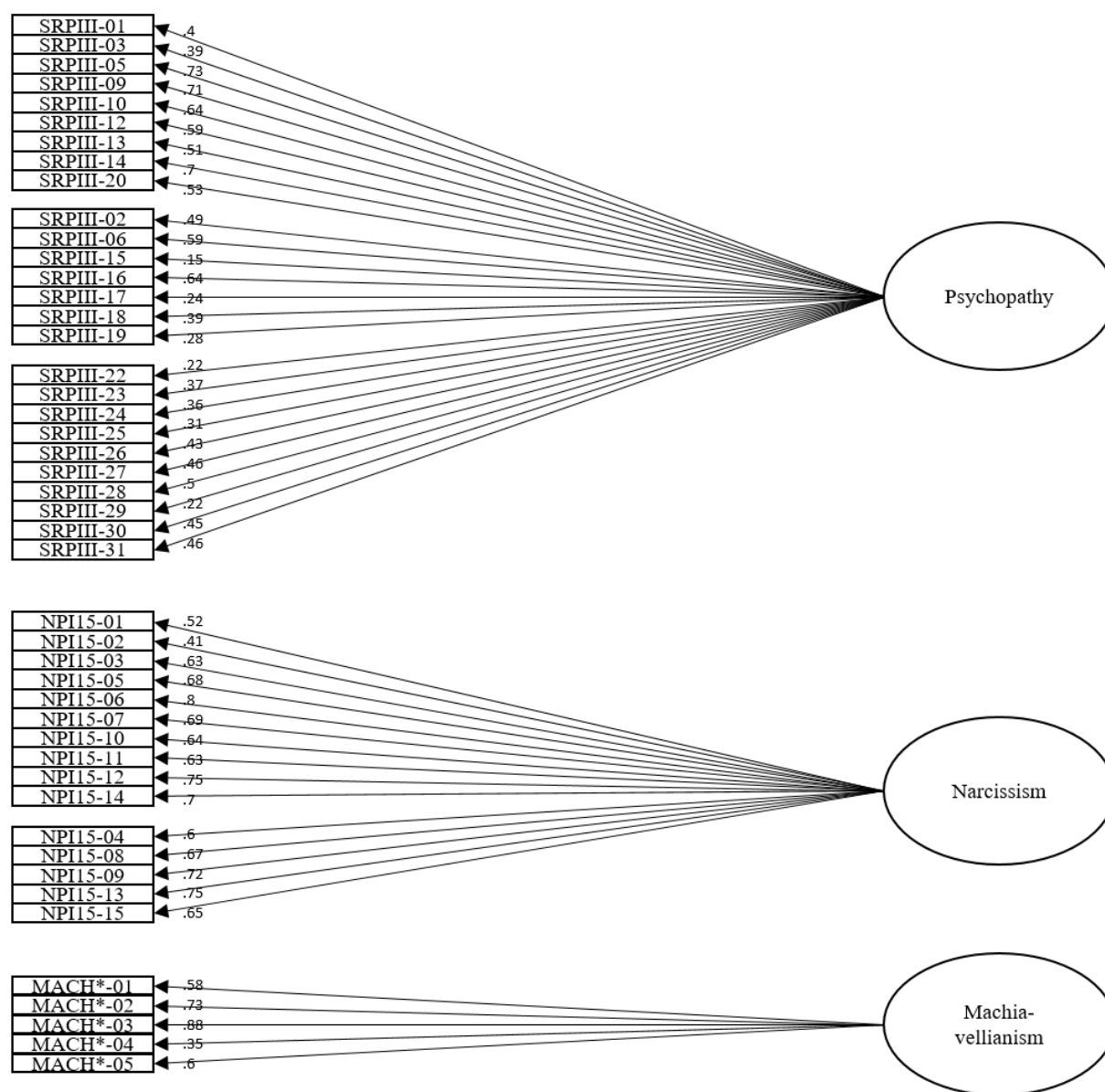


Figure D2. Structural equation model of the Dark Triad. Standardized factor loadings are presented. DWLS estimator used. SRPIII = psychopathy measure; NPI = narcissism measure; MACH* = Machiavellianism measure.

Path diagram of confirmatory factor analysis for six-factor model

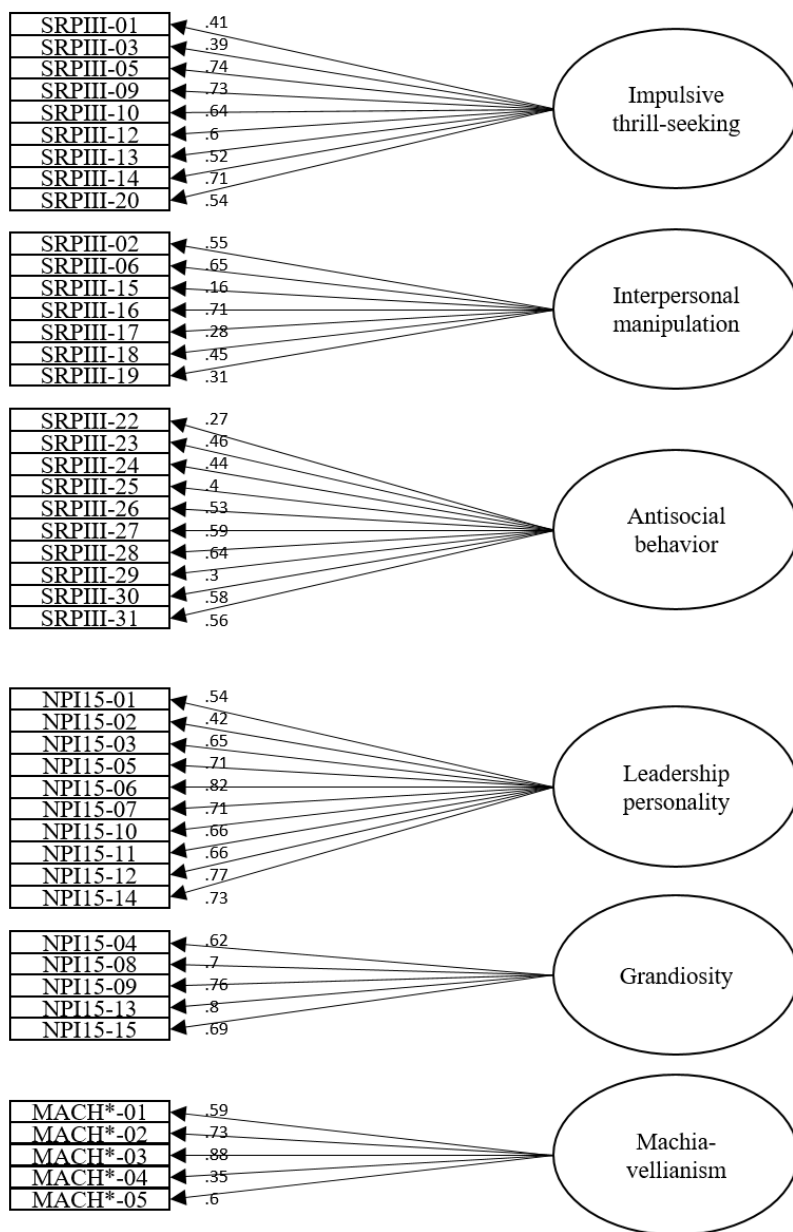


Figure D3. Structural equation model of the six-factor model. Standardized factor loadings are presented. DWLS estimator used. SRPIII = psychopathy measure; NPI = narcissism measure; MACH* = Machiavellianism measure.

Path diagram of confirmatory factor analysis for hierarchical Dark Triad model

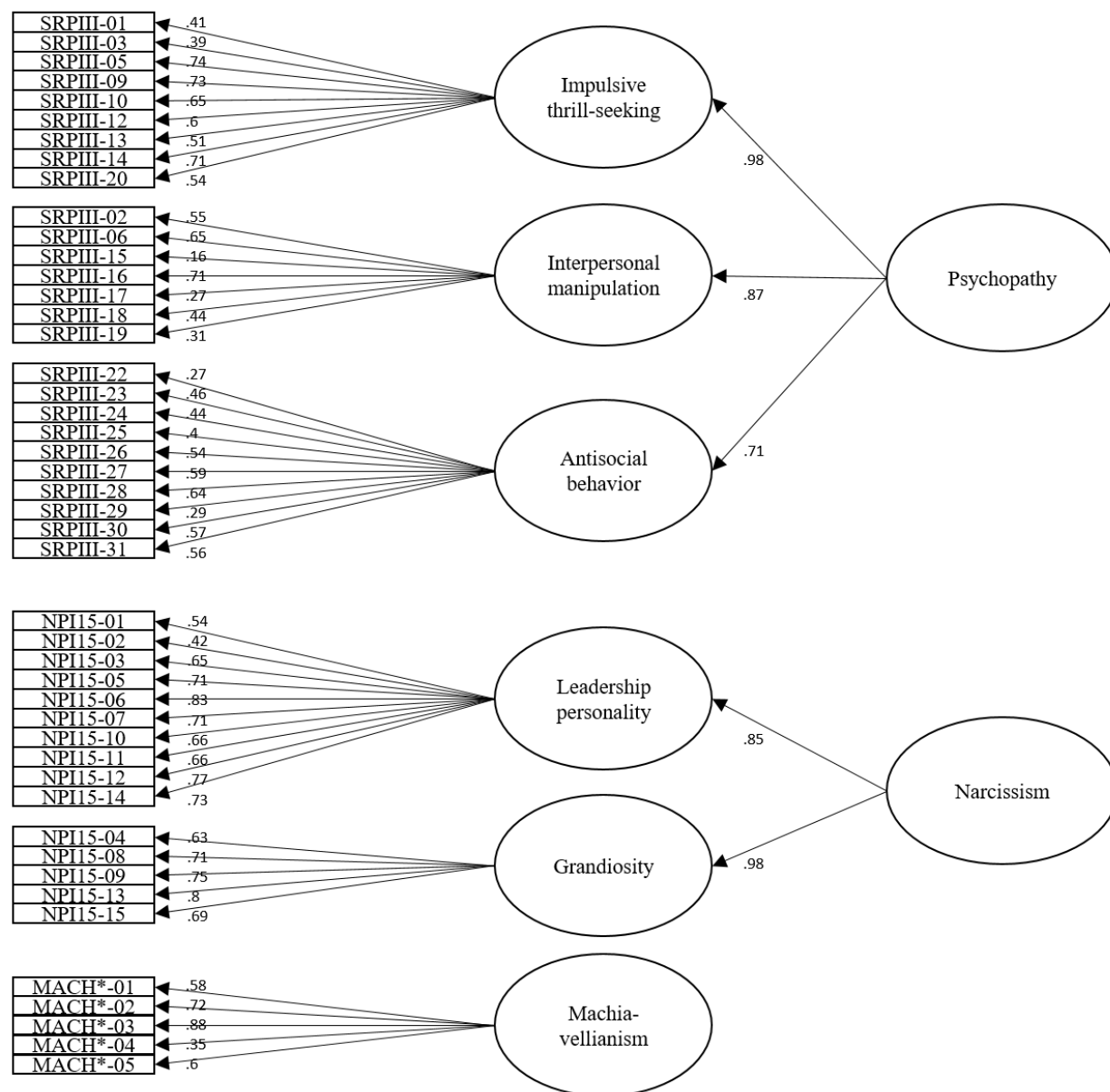


Figure D4. Structural equation model of the hierarchical Dark Triad model. Standardized factor loadings are presented. DWLS estimator used. SRPIII = psychopathy measure; NPI = narcissism measure; MACH* = Machiavellianism measure.

Path diagram of confirmatory factor analysis for hierarchical Dark Core model

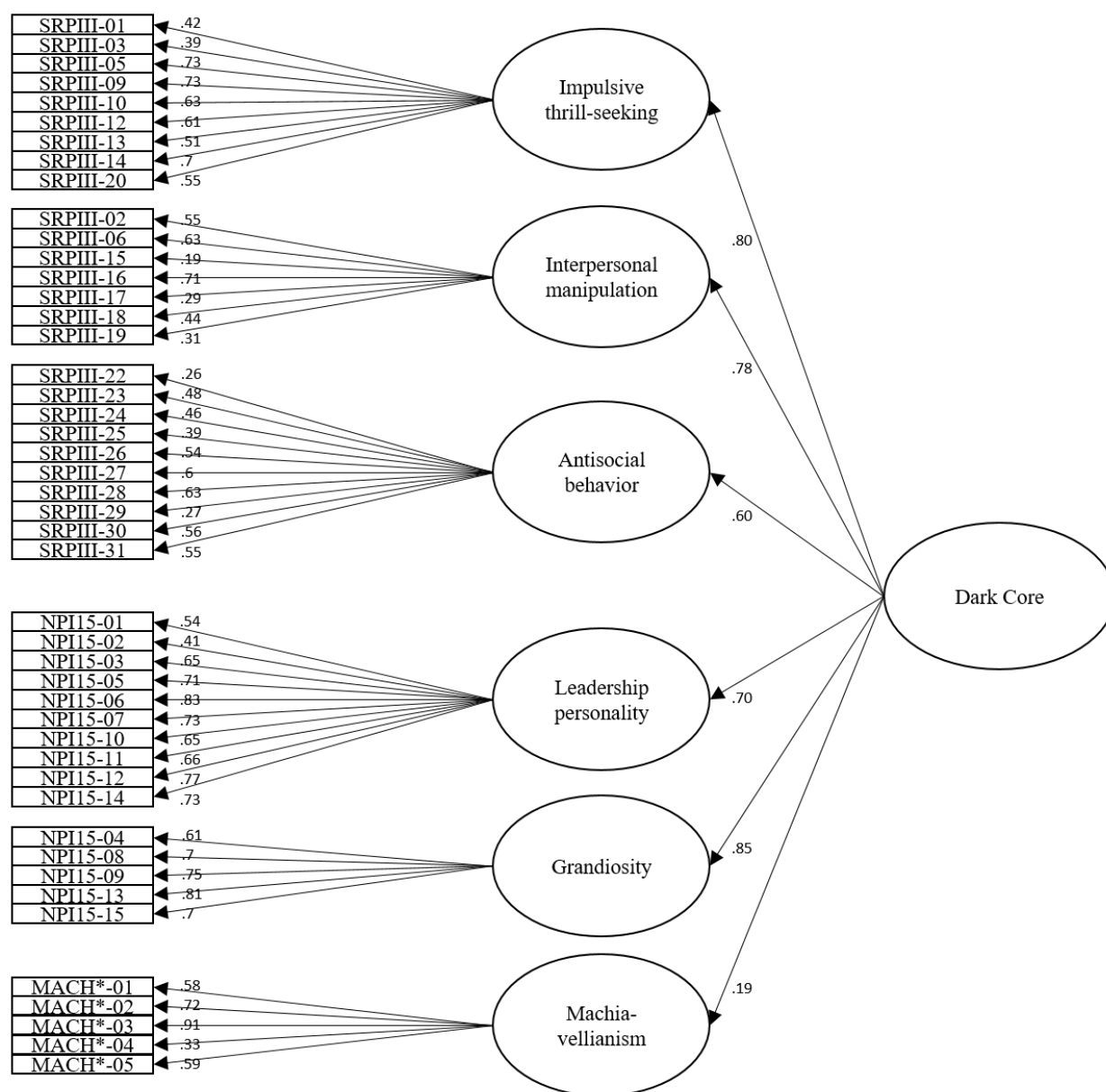


Figure D5. Structural equation model of the hierarchical Dark Core model. Standardized factor loadings are presented. DWLS estimator used. SRPIII = psychopathy measure; NPI = narcissism measure; MACH* = Machiavellianism measure.

Appendix E
Factor Loadings of ESEM

Table E1

Factor loadings of ESEM using DWLS estimator and Geomin rotation in a one-factor model (N = 734)

Item	Factor loadings
	Factor 1
GRAND1	0.582
GRAND2	0.613
GRAND3	0.733
GRAND4	0.712
GRAND5	0.641
LEADER1	0.495
LEADER2	0.365
LEADER3	0.759
LEADER4	0.710
LEADER5	0.771
LEADER6	0.663
LEADER7	0.779
LEADER8	0.659
LEADER9	0.749
LEADER10	0.720
MACH1	0.068
MACH2	0.132
MACH3	0.273
MACH4	-0.032
MACH5	0.200
INTERP1	0.460
INTERP2	0.556
INTERP3	0.151
INTERP4	0.567
INTERP5	0.230
INTERP6	0.359
INTERP7	0.256
COLD1	-0.024
COLD2	0.380
COLD3	0.308
COLD4	0.147
COLD5	0.441
THRILL1	0.362
THRILL2	0.374
THRILL3	0.642
THRILL4	0.647
THRILL5	0.562
THRILL6	0.539
THRILL7	0.445
THRILL8	0.641
THRILL9	0.445
ANTI1	0.404
ANTI2	0.374
ANTI3	0.271
ANTI4	0.486
ANTI5	0.373
ANTI6	0.428
ANTI7	0.483
ANTI8	0.539
ANTI9	0.509
ANTI10	0.626

Note. Factor loadings over .30 appear in bold. GRAND = Items of grandiosity scale of NPI-15; LEADER = Items of leadership personality scale of NPI-15; MACH = Items of MACH*; INTERP = Items of interpersonal manipulation scale of SRP-III; COLD = Items of cold affect

scale of SRP-III; THRILL = Items of impulsive thrill-seeking scale of SRP-III; ANTI = Items of antisocial behavior scale of SRP-III.

Table E2

Factor loadings of ESEM using DWLS estimator and Geomin rotation in a three-factor model (N = 734)

Item	Factor loadings		
	Factor 1	Factor 2	Factor 3
GRAND1	0.631	-0.294	0.072
GRAND2	0.651	-0.110	0.041
GRAND3	0.744	0.112	0.019
GRAND4	0.704	-0.059	0.099
GRAND5	0.625	-0.204	0.144
LEADER1	0.617	-0.103	-0.077
LEADER2	0.463	-0.112	-0.055
LEADER3	0.808	-0.448	0.021
LEADER4	0.876	-0.055	-0.230
LEADER5	0.836	0.068	-0.079
LEADER6	0.626	0.000	0.130
LEADER7	0.843	-0.436	-0.001
LEADER8	0.854	0.012	-0.290
LEADER9	0.878	0.074	-0.190
LEADER10	0.879	0.073	-0.255
MACH1	-0.102	0.688	0.004
MACH2	-0.076	0.825	0.013
MACH3	0.064	0.727	0.089
MACH4	-0.171	0.460	0.036
MACH5	0.003	0.475	0.130
INTERP1	0.193	0.158	0.346
INTERP2	0.083	0.135	0.603
INTERP3	0.210	-0.179	0.001
INTERP4	0.206	0.138	0.487
INTERP5	0.108	0.177	0.136
INTERP6	0.062	0.224	0.352
INTERP7	0.060	0.245	0.206
COLD1	-0.044	-0.193	0.072
COLD2	-0.042	0.109	0.521
COLD3	0.394	-0.152	-0.015
COLD4	0.031	0.376	0.061
COLD5	0.226	0.196	0.271
THRILL1	0.156	0.055	0.292
THRILL2	0.087	-0.113	0.431
THRILL3	0.133	-0.048	0.696
THRILL4	0.196	-0.047	0.635
THRILL5	0.105	0.031	0.614
THRILL6	0.247	0.100	0.406
THRILL7	0.077	-0.027	0.506
THRILL8	0.201	0.014	0.604
THRILL9	0.127	-0.191	0.500
ANTI1	-0.122	0.148	0.581
ANTI2	-0.010	-0.065	0.521
ANTI3	0.000	-0.002	0.372
ANTI4	-0.109	0.096	0.668
ANTI5	-0.013	0.025	0.505
ANTI6	-0.087	-0.128	0.689
ANTI7	-0.095	-0.043	0.733
ANTI8	-0.204	0.032	0.824
ANTI9	-0.096	-0.036	0.757
ANTI10	0.038	0.244	0.653

Note. Factor loadings over .30 or below -.30 appear in bold. GRAND = Items of grandiosity scale of NPI-15; LEADER = Items of leadership personality scale of NPI-15; MACH = Items of MACH*; INTERP = Items of interpersonal manipulation scale of SRP-III; COLD = Items of

cold affect scale of SRP-III; THRILL = Items of impulsive thrill-seeking scale of SRP-III; ANTI = Items of antisocial behavior scale of SRP-III.

Table E3

Factor loadings of ESEM using DWLS estimator and Geomin rotation in a four-factor model (N = 734)

Item	Factor loadings			
	Factor 1	Factor 2	Factor 3	Factor 4
GRAND1	0.594	0.166	-0.163	0.062
GRAND2	0.537	0.238	0.031	0.037
GRAND3	0.493	0.376	0.264	0.031
GRAND4	0.471	0.351	0.043	0.129
GRAND5	0.540	0.203	-0.085	0.147
LEADER1	0.079	0.566	-0.141	0.056
LEADER2	0.271	0.260	-0.057	-0.022
LEADER3	0.866	0.058	-0.059	-0.053
LEADER4	0.024	0.839	-0.158	0.014
LEADER5	0.348	0.589	0.128	0.012
LEADER6	0.206	0.484	0.013	0.223
LEADER7	0.923	0.056	-0.027	-0.093
LEADER8	0.029	0.817	-0.071	-0.065
LEADER9	0.297	0.669	0.105	-0.070
LEADER10	0.072	0.812	0.014	-0.042
MACH1	-0.053	-0.043	0.696	-0.035
MACH2	-0.021	-0.035	0.848	-0.037
MACH3	-0.025	0.111	0.736	0.078
MACH4	-0.025	-0.141	0.480	-0.019
MACH5	0.004	0.017	0.491	0.109
INTERP1	0.053	0.168	0.170	0.369
INTERP2	0.205	-0.072	0.200	0.568
INTERP3	-0.108	0.297	-0.239	0.089
INTERP4	0.140	0.110	0.174	0.494
INTERP5	0.086	0.051	0.207	0.128
INTERP6	0.074	0.016	0.256	0.337
INTERP7	-0.057	0.119	0.240	0.222
COLD1	0.220	-0.230	-0.113	0.007
COLD2	0.173	-0.179	0.175	0.466
COLD3	0.024	0.382	-0.184	0.076
COLD4	0.029	0.019	0.412	0.039
COLD5	0.234	0.050	0.277	0.249
THRILL1	0.001	0.165	0.047	0.326
THRILL2	0.150	-0.030	-0.073	0.419
THRILL3	0.007	0.144	-0.065	0.726
THRILL4	-0.066	0.265	-0.095	0.700
THRILL5	0.026	0.096	0.026	0.633
THRILL6	-0.136	0.372	0.043	0.495
THRILL7	0.255	-0.123	0.049	0.462
THRILL8	0.070	0.161	0.025	0.630
THRILL9	0.299	-0.114	-0.109	0.463
ANTI1	-0.149	0.008	0.118	0.583
ANTI2	0.203	-0.173	-0.007	0.474
ANTI3	0.132	-0.104	0.034	0.342
ANTI4	-0.195	0.054	0.042	0.689
ANTI5	0.025	-0.028	0.024	0.502
ANTI6	0.047	-0.127	-0.120	0.671
ANTI7	-0.025	-0.075	-0.056	0.729
ANTI8	-0.299	0.046	-0.039	0.844
ANTI9	-0.009	-0.083	-0.040	0.743
ANTI10	-0.016	0.068	0.254	0.652

Note. Factor loadings over .30 or below -.30 appear in bold. GRAND = Items of grandiosity scale of NPI-15; LEADER = Items of leadership personality scale of NPI-15; MACH = Items of MACH*; INTERP = Items of interpersonal manipulation scale of SRP-III; COLD = Items of

cold affect scale of SRP-III; THRILL = Items of impulsive thrill-seeking scale of SRP-III; ANTI = Items of antisocial behavior scale of SRP-III.

Table E4

Factor loadings of ESEM using DWLS estimator and Geomin rotation in a five-factor model (N = 734)

Item	Factor loadings				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
GRAND1	0.485	-0.076	-0.005	-0.113	0.528
GRAND2	0.603	0.069	0.021	-0.163	0.221
GRAND3	0.727	0.280	0.041	-0.113	0.038
GRAND4	0.599	0.115	0.080	-0.010	0.333
GRAND5	0.449	0.017	0.077	-0.038	0.544
LEADER1	0.526	-0.116	0.051	0.239	0.043
LEADER2	0.387	-0.015	-0.055	0.027	0.238
LEADER3	0.773	-0.085	0.017	-0.466	0.035
LEADER4	0.732	-0.135	0.019	0.373	-0.036
LEADER5	0.803	0.134	0.036	0.051	-0.047
LEADER6	0.567	0.027	0.239	0.114	-0.008
LEADER7	0.829	-0.052	-0.024	-0.512	0.032
LEADER8	0.737	-0.054	-0.057	0.343	-0.087
LEADER9	0.821	0.126	-0.067	0.132	0.003
LEADER10	0.756	0.040	-0.044	0.332	-0.039
MACH1	-0.096	0.700	-0.060	0.035	0.012
MACH2	-0.063	0.851	-0.063	0.023	0.009
MACH3	0.030	0.755	0.043	0.116	0.076
MACH4	-0.112	0.469	-0.019	-0.072	-0.103
MACH5	-0.056	0.518	0.075	0.076	0.168
INTERP1	0.178	0.171	0.384	0.050	-0.068
INTERP2	0.051	0.208	0.585	-0.115	0.063
INTERP3	0.115	-0.216	0.076	0.246	0.097
INTERP4	0.165	0.183	0.508	-0.005	0.023
INTERP5	0.133	0.202	0.143	-0.038	-0.088
INTERP6	0.058	0.253	0.355	-0.019	-0.047
INTERP7	0.087	0.223	0.248	0.065	-0.188
COLD1	0.044	-0.149	0.050	-0.294	-0.135
COLD2	-0.034	0.169	0.488	-0.178	-0.004
COLD3	0.259	-0.140	0.050	0.251	0.227
COLD4	0.106	0.389	0.065	-0.064	-0.235
COLD5	0.276	0.266	0.262	-0.155	-0.117
THRILL1	0.026	0.091	0.298	0.180	0.250
THRILL2	0.080	-0.079	0.447	-0.100	-0.015
THRILL3	-0.005	-0.021	0.709	0.154	0.233
THRILL4	0.028	-0.043	0.673	0.271	0.247
THRILL5	-0.009	0.061	0.626	0.111	0.179
THRILL6	0.133	0.071	0.490	0.304	0.051
THRILL7	0.062	0.052	0.483	-0.185	0.066
THRILL8	0.118	0.045	0.640	0.084	0.082
THRILL9	0.043	-0.081	0.462	-0.152	0.268
ANTI1	0.049	0.046	0.594	-0.087	-0.514
ANTI2	-0.002	-0.013	0.499	-0.200	0.007
ANTI3	-0.074	0.058	0.337	-0.053	0.214
ANTI4	-0.044	0.006	0.707	0.046	-0.318
ANTI5	-0.076	0.039	0.506	0.017	0.101
ANTI6	-0.117	-0.125	0.702	-0.069	0.000
ANTI7	-0.136	-0.061	0.761	-0.001	-0.023
ANTI8	-0.026	-0.129	0.877	0.025	-0.620
ANTI9	-0.088	-0.056	0.779	-0.047	-0.123
ANTI10	0.082	0.231	0.666	-0.004	0.485

Note. Factor loadings over .30 or below -.30 appear in bold. GRAND = Items of grandiosity scale of NPI-15; LEADER = Items of leadership personality scale of NPI-15; MACH = Items of MACH*; INTERP = Items of interpersonal manipulation scale of SRP-III; COLD = Items of

cold affect scale of SRP-III; THRILL = Items of impulsive thrill-seeking scale of SRP-III; ANTI = Items of antisocial behavior scale of SRP-III.

Appendix F

Results of Measurement Invariance Analyses

Following recommendations of Putnick and Bornstein (2016), measurement invariance was tested in a sequential procedure using the following steps: a) testing of configural invariance, b) testing of metric invariance, c) testing of scalar invariance, and d) testing of residual invariance. Multi-group SEM analysis were used to determine, if the factorial structure is comparable in different subgroups (sex and educational status). However, sample sizes were too small to conduct multi-group analysis with items as a basic unit. Therefore, item parcels were computed using 2-3 items per parcel for which unidimensionality was shown. Item-parcels were not computed for Machiavellianism, because the MACH* only contains five items. All items of SRP-III and NPI-15 were used to compute parcels. Based on factor loadings of ESEM analysis, a three-factor model representing the Dark Triad, which showed the most theoretically plausible factor loadings, was specified for analysis. Parameters were subsequently restricted to test measurement invariance in subgroups: a) configural invariance, the same factor structure was imposed on all groups; b) metric invariance, the factor loadings were constrained to be equal across groups; c) scalar invariance, the factor loadings and intercepts were constrained to be equal across groups; and d) residual invariance, the factor loadings, intercepts and residuals were constrained to be equal across groups. Table F1 and F2 display results of model comparison respectively with sex and educational status (university students/no university students) as grouping variables. Sample sizes in subgroups (men and university students) were too small to compute Gamma. When considering standard criteria for model evaluation (Hu & Bentler, 1999), residual invariance can be assumed for groups with different educational statuses (university and no university students) and configural invariance can be assumed for individuals with different sexes.

Table F1

Model comparison with a three-factor model constrained to configural invariance as a baseline (groups = sex)

Model	χ^2 (df)	CFI	RMSEA
M1: Configural invariance	1016.8*** (498)	0.951	0.057
M2: Metric invariance	1114.5*** (519)	0.943	0.060
M3: Scalar invariance	1166.5*** (540)	0.941	0.060
M4: Residual invariance	1231.4*** (564)	0.937	0.061

Note. $N = 642$; group 1 (women) $n = 345$; group 2 (men) $n = 297$. DWLS estimator used. Item parcels used as a basic unit.

*** $p < .001$.

Table F2

Model comparison with a three-factor model constrained to configural invariance as a baseline (groups = university/no university students)

Model	χ^2 (df)	CFI	RMSEA
M1: Configural invariance	1006.6*** (498)	0.955	0.057
M2: Metric invariance	1067.0*** (519)	0.952	0.058
M3: Scalar invariance	1104.8*** (540)	0.950	0.057
M4: Residual invariance	1130.3*** (564)	0.950	0.056

Note. $N = 639$; group 1 (university students) $n = 257$; group 2 (no university students) $n = 382$. DWLS estimator used. Item parcels used as a basic unit.

* $p < .05$. *** $p < .001$.

Appendix G

Results of Subgroup Analysis concerning Associations of Dark Personality Facets, Jealousy and Infidelity

Table G1

Regression results using infidelity experience as the criterion (subgroup = female)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	0.67	[-0.41, 1.75]						
SRPIII_ITS	0.03	[-0.03, 0.09]	0.09	[-0.07, 0.25]	.00	[-.01, .02]	.19**	
SRPIII_ASB	0.07*	[0.00, 0.14]	0.15	[0.00, 0.30]	.01	[-.01, .04]	.19**	
SRPIII_IM	0.02	[-0.08, 0.13]	0.03	[-0.11, 0.18]	.00	[-.00, .01]	.13*	
NPI15_GRAND	-0.06	[-0.14, 0.01]	-0.16	[-0.35, 0.03]	.01	[-.01, .03]	.08	
NPI15_LEAD	0.04*	[0.00, 0.08]	0.19	[0.01, 0.37]	.01	[-.01, .04]	.15*	
HSNS_OVERS	-0.02	[-0.11, 0.06]	-0.04	[-0.16, 0.08]	.00	[-.01, .01]	-.03	
HSNS_EGO	0.04	[-0.10, 0.19]	0.04	[-0.09, 0.16]	.00	[-.01, .01]	.03	
MACH	-0.04	[-0.09, 0.02]	-0.08	[-0.21, 0.05]	.01	[-.01, .02]	-.04	
								$R^2 = .072^{**}$
								95% CI[.01,.11]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G2

Regression results using intention towards infidelity as the criterion (subgroup = female)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	5.95**	[1.95, 9.95]						
SRPIII_ITS	0.25*	[0.04, 0.47]	0.17	[0.02, 0.31]	.01	[-.01, .04]	.28**	
SRPIII_ASB	0.06	[-0.21, 0.32]	0.03	[-0.10, 0.16]	.00	[-.00, .01]	.22**	
SRPIII_IM	0.45*	[0.06, 0.83]	0.15	[0.02, 0.28]	.01	[-.01, .04]	.28**	
NPI15_GRAND	0.11	[-0.17, 0.38]	0.07	[-0.10, 0.24]	.00	[-.01, .01]	.18**	
NPI15_LEAD	-0.05	[-0.20, 0.10]	-0.05	[-0.22, 0.11]	.00	[-.01, .01]	.10	
HSNS_OVERS	0.23	[-0.08, 0.53]	0.08	[-0.03, 0.19]	.01	[-.01, .02]	.13*	
HSNS_EGO	0.44	[-0.10, 0.97]	0.09	[-0.02, 0.21]	.01	[-.01, .02]	.17**	
MACH	0.01	[-0.21, 0.22]	0.00	[-0.11, 0.12]	.00	[-.00, .00]	.11*	
								<i>R</i> ² = .129** 95% CI[.05,.18]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G3

Regression results using romantic jealousy-induction as the criterion (subgroup = female)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	2.09	[-1.62, 5.80]						
SRPIII_ITS	0.18	[-0.02, 0.39]	0.12	[-0.02, 0.26]	.01	[-.01, .03]	.29**	
SRPIII_ASB	0.07	[-0.18, 0.32]	0.04	[-0.09, 0.16]	.00	[-.00, .01]	.23**	
SRPIII_IM	0.58**	[0.23, 0.93]	0.21	[0.08, 0.34]	.03	[-.00, .06]	.33**	
NPI15_GRAND	0.01	[-0.24, 0.26]	0.01	[-0.16, 0.17]	.00	[-.00, .00]	.20**	
NPI15_LEAD	0.04	[-0.09, 0.18]	0.05	[-0.11, 0.20]	.00	[-.01, .01]	.16**	
HSNS_OVERS	0.19	[-0.10, 0.47]	0.07	[-0.04, 0.18]	.00	[-.01, .02]	.11*	
HSNS_EGO	0.43	[-0.07, 0.94]	0.10	[-0.02, 0.21]	.01	[-.01, .02]	.19**	
MACH	0.10	[-0.10, 0.30]	0.06	[-0.06, 0.17]	.00	[-.01, .01]	.16**	
								$R^2 = .157^{**}$
								95% CI[.07,.21]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G4

Regression results using cognitive jealousy as the criterion (subgroup = female)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	3.69	[-1.97, 9.34]						
SRPIII_ITS	0.18	[-0.12, 0.49]	0.08	[-0.06, 0.22]	.00	[-.01, .02]	.23**	
SRPIII_ASB	0.38*	[0.00, 0.75]	0.13	[0.00, 0.26]	.01	[-.01, .03]	.26**	
SRPIII_IM	0.45	[-0.08, 0.97]	0.11	[-0.02, 0.24]	.01	[-.01, .02]	.24**	
NPI15_GRAND	0.35	[-0.02, 0.73]	0.16	[-0.01, 0.32]	.01	[-.01, .03]	.10	
NPI15_LEAD	-0.29**	[-0.49, -0.08]	-0.22	[-0.38, -0.07]	.02	[-.01, .05]	-.04	
HSNS_OVERS	0.36	[-0.07, 0.80]	0.09	[-0.02, 0.20]	.01	[-.01, .02]	.14**	
HSNS_EGO	0.22	[-0.54, 0.98]	0.03	[-0.08, 0.14]	.00	[-.00, .01]	.14*	
MACH	0.37*	[0.07, 0.67]	0.14	[0.03, 0.25]	.02	[-.01, .04]	.23**	
								<i>R</i> ² = .153**
								95% CI[.07,.21]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G5

Regression results using infidelity experience as the criterion (subgroup = male)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	-0.80	[-1.80, 0.20]						
SRPIII_ITS	0.04	[-0.02, 0.10]	0.13	[-0.05, 0.31]	.01	[-.01, .03]	.23**	
SRPIII_ASB	0.07*	[0.01, 0.13]	0.18	[0.02, 0.33]	.02	[-.01, .05]	.21**	
SRPIII_IM	-0.08	[-0.18, 0.01]	-0.14	[-0.29, 0.02]	.01	[-.01, .04]	.08	
NPI15_GRAND	-0.06	[-0.13, 0.00]	-0.17	[-0.35, 0.01]	.01	[-.01, .04]	.13*	
NPI15_LEAD	0.06**	[0.02, 0.10]	0.28	[0.10, 0.45]	.04	[-.01, .08]	.24**	
HSNS_OVERS	0.04	[-0.04, 0.13]	0.07	[-0.06, 0.20]	.00	[-.01, .02]	.09	
HSNS_EGO	0.12	[-0.02, 0.26]	0.12	[-0.02, 0.26]	.01	[-.01, .03]	.18**	
MACH	0.00	[-0.05, 0.06]	0.01	[-0.13, 0.14]	.00	[-.00, .00]	.08	
								$R^2 = .128^{**}$
								95% CI[.04,.18]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G6

Regression results using intention towards infidelity as the criterion (subgroup = male)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	8.64**	[4.07, 13.22]						
SRPIII_ITS	0.09	[-0.18, 0.35]	0.06	[-0.11, 0.23]	.00	[-.01, .01]	.14*	
SRPIII_ASB	0.10	[-0.16, 0.36]	0.06	[-0.09, 0.21]	.00	[-.01, .01]	.13*	
SRPIII_IM	0.14	[-0.27, 0.55]	0.05	[-0.10, 0.20]	.00	[-.01, .01]	.13*	
NPI15_GRAND	-0.06	[-0.33, 0.22]	-0.03	[-0.21, 0.14]	.00	[-.00, .01]	.12*	
NPI15_LEAD	0.06	[-0.11, 0.23]	0.06	[-0.11, 0.22]	.00	[-.01, .01]	.11	
HSNS_OVERS	0.50**	[0.14, 0.86]	0.17	[0.05, 0.30]	.03	[-.01, .06]	.19**	
HSNS_EGO	0.36	[-0.26, 0.98]	0.08	[-0.06, 0.21]	.00	[-.01, .02]	.14*	
MACH	-0.05	[-0.28, 0.19]	-0.03	[-0.16, 0.10]	.00	[-.00, .01]	.05	
								<i>R</i> ² = .065*
								95% CI[.00,.10]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G7

Regression results using romantic jealousy-induction as the criterion (subgroup = male)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	3.80*	[0.30, 7.31]						
SRPIII_ITS	0.26*	[0.05, 0.47]	0.21	[0.04, 0.38]	.02	[-.01, .05]	.28**	
SRPIII_ASB	-0.06	[-0.27, 0.15]	-0.04	[-0.18, 0.11]	.00	[-.01, .01]	.14*	
SRPIII_IM	0.07	[-0.25, 0.39]	0.03	[-0.11, 0.18]	.00	[-.00, .01]	.19**	
NPI15_GRAND	-0.02	[-0.24, 0.19]	-0.02	[-0.19, 0.15]	.00	[-.00, .00]	.22**	
NPI15_LEAD	0.12	[-0.02, 0.25]	0.14	[-0.02, 0.30]	.01	[-.01, .03]	.25**	
HSNS_OVERS	0.28	[-0.01, 0.57]	0.12	[-0.00, 0.24]	.01	[-.01, .04]	.16**	
HSNS_EGO	0.17	[-0.32, 0.65]	0.04	[-0.08, 0.17]	.00	[-.01, .01]	.15*	
MACH	0.04	[-0.14, 0.23]	0.03	[-0.10, 0.15]	.00	[-.00, .01]	.11	
								$R^2 = .118^{**}$
								95% CI[.04,.17]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Table G8

Regression results using cognitive jealousy as the criterion (subgroup = male)

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit
(Intercept)	0.08	[-5.60, 5.75]						
SRPIII_ITS	0.56**	[0.22, 0.90]	0.27	[0.11, 0.43]	.03	[-.01, .07]	.25**	
SRPIII_ASB	-0.23	[-0.56, 0.11]	-0.10	[-0.23, 0.04]	.01	[-.01, .02]	.11	
SRPIII_IM	0.06	[-0.47, 0.58]	0.01	[-0.12, 0.15]	.00	[-.00, .00]	.17**	
NPI15_GRAND	0.25	[-0.10, 0.61]	0.11	[-0.05, 0.27]	.01	[-.01, .02]	.23**	
NPI15_LEAD	-0.15	[-0.37, 0.06]	-0.11	[-0.26, 0.04]	.01	[-.01, .02]	.13*	
HSNS_OVERS	1.03**	[0.56, 1.49]	0.26	[0.14, 0.37]	.06	[.01, .11]	.31**	
HSNS_EGO	0.23	[-0.55, 1.01]	0.04	[-0.09, 0.16]	.00	[-.01, .01]	.20**	
MACH	0.27	[-0.03, 0.58]	0.11	[-0.01, 0.23]	.01	[-.01, .03]	.19**	
								<i>R</i> ² = .179**
								95% CI[.08,.24]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism.

* indicates $p < .05$. ** indicates $p < .01$.

Appendix H

Associations of Dark Personality Traits and Verbal Attractiveness Ratings among both Men and Women

Table H1

Means, standard deviations, and correlations with confidence intervals in condition with high psychopathy vignette

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10
1. SRPIII_ITS	12.70	4.30										
2. SRPIII_ASB	8.84	3.71	.60** [.53, .66]									
3. SRPIII_IM	7.24	2.39	.62** [.56, .68]	.50** [.42, .58]								
4. NPI15_GRAND	10.77	3.96	.53** [.45, .60]	.25** [.15, .34]	.44** [.35, .52]							
5. NPI15_LEAD	20.21	6.71	.46** [.38, .54]	.19** [.09, .29]	.39** [.30, .47]	.76** [.72, .80]						
6. HSNS_OVERS	9.14	2.14	-.03 [-.13, .07]	-.07 [-.17, .04]	-.05 [-.15, .05]	.07 [-.03, .17]	-.07 [-.17, .04]					
7. HSNS_EGO	4.24	1.44	.24** [.14, .34]	.16** [.06, .26]	.23** [.13, .32]	.23** [.14, .33]	.18** [.07, .27]	.17** [.07, .27]				
8. MACH	8.88	3.54	.15** [.05, .25]	.13* [.03, .23]	.33** [.23, .41]	.05 [-.05, .15]	.02 [-.09, .12]	.03 [-.08, .13]	.38** [.29, .47]			
9. GEN_ATTR	2.47	1.36	.22** [.12, .32]	.10 [-.00, .20]	.15** [.05, .25]	.23** [.13, .32]	.24** [.14, .34]	.03 [-.07, .13]	.14** [.04, .23]	.16** [.06, .26]		
10. SHORT_REL	2.53	1.65	.31** [.22, .40]	.21** [.11, .30]	.23** [.13, .32]	.29** [.19, .38]	.23** [.13, .33]	.06 [-.05, .16]	.10 [-.00, .20]	.03 [-.07, .13]	.42** [.33, .50]	
11. LONG_REL	2.01	1.44	.12* [.02, .22]	.06 [-.04, .16]	.07 [-.03, .17]	.19** [.09, .29]	.17** [.07, .27]	.00 [-.10, .10]	.03 [-.07, .13]	.06 [-.04, .17]	.65** [.59, .70]	.45** [.37, .53]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; GEN_ATTR = Ratings of general attractiveness; SHORT_REL = Interest in a short-term relationship; LONG_REL = Interest in a long-term relationship.

* indicates $p < .05$. ** indicates $p < .01$.

Table H2

Means, standard deviations, and correlations with confidence intervals in condition with low psychopathy vignette

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10
1. SRPIII_ITS	12.17	4.18										
2. SRPIII_ASB	8.42	3.25	.62** [.55, .68]									
3. SRPIII_IM	7.09	2.29	.53** [.45, .60]	.49** [.41, .57]								
4. NPI15_GRAND	10.36	3.98	.37** [.28, .46]	.30** [.20, .39]	.38** [.29, .47]							
5. NPI15_LEAD	19.89	6.61	.38** [.28, .46]	.21** [.10, .31]	.31** [.21, .41]	.69** [.63, .74]						
6. HSNS_OVERS	9.15	2.43	.02 [-.08, .13]	.12* [.01, .22]	-.00 [-.11, .10]	.24** [.14, .34]	.08 [-.02, .19]					
7. HSNS_EGO	4.25	1.36	.17** [.07, .27]	.11 [-.00, .21]	.23** [.13, .33]	.16** [.05, .26]	.09 [-.02, .19]	.22** [.11, .31]				
8. MACH	9.09	3.43	.13* [.03, .24]	.08 [-.03, .18]	.19** [.09, .29]	.07 [-.03, .18]	.03 [-.07, .14]	.11* [.00, .21]	.40** [.31, .49]			
9. GEN_ATTR	2.97	1.36	.03 [-.08, .13]	.02 [-.08, .13]	.05 [-.05, .16]	.19** [.08, .29]	.21** [.11, .31]	.04 [-.06, .14]	.10 [-.01, .20]	.19** [.09, .29]		
10. SHORT_REL	2.48	1.60	.33** [.24, .42]	.26** [.16, .36]	.28** [.18, .37]	.22** [.12, .31]	.21** [.10, .31]	.09 [-.02, .19]	.18** [.08, .28]	.09 [-.02, .19]	.33** [.23, .42]	
11. LONG_REL	2.47	1.55	.13* [.03, .23]	.14** [.04, .24]	.15** [.05, .25]	.27** [.17, .36]	.24** [.14, .34]	.04 [-.06, .15]	.07 [-.04, .17]	.06 [-.04, .17]	.67** [.61, .73]	.40** [.31, .48]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; GEN_ATTR = Ratings of general attractiveness; SHORT_REL = Interest in a short-term relationship; LONG_REL = Interest in a long-term relationship.

* indicates $p < .05$. ** indicates $p < .01$.

Appendix I

Correlation Tables of Dark Personality Facets and Facial Attractiveness Ratings

Table II

Means, standard deviations, and correlations with confidence intervals of dark personality facets and facial attractiveness ratings of men in women

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. SRPIII_ITS	11.37	3.89															
2. SRPIII_ASB	7.83	2.95	.56** [.48, .62]														
3. SRPIII_IM	6.50	2.03	.50** [.42, .57]	.44** [.36, .52]													
4. NPI15_GRAND	9.98	3.79	.39** [.29, .47]	.20** [.10, .30]	.35** [.26, .44]												
5. NPI15_LEAD	19.05	6.58	.33** [.23, .42]	.13* [.03, .23]	.27** [.17, .36]	.74** [.69, .78]											
6. HSNS_OVERS	9.57	2.16	.05 [-.05, .15]	.06 [-.04, .16]	-.00 [-.11, .10]	.14** [.04, .24]	-.02 [-.12, .09]										
7. HSNS_EGO	3.91	1.24	.10 [-.01, .20]	.03 [-.07, .14]	.10 [-.00, .20]	.11* [.01, .21]	.06 [-.04, .17]	.22** [.12, .32]									
8. MACH	8.37	3.22	.13* [.03, .23]	.14** [.04, .24]	.23** [.13, .33]	-.04 [-.14, .07]	-.12* [-.23, -.02]	.04 [-.07, .14]	.31** [.21, .40]								
9. M_HIGH_PSY	3.14	1.14	-.06 [-.16, .05]	-.10* [-.20, -.00]	-.04 [-.14, .07]	.09 [-.01, .20]	.07 [-.03, .18]	.00 [-.10, .10]	.00 [-.10, .10]	-.01 [-.12, .09]							
10. M_LOW_MACH	2.32	1.03	-.07 [-.17, .04]	-.04 [-.15, .06]	-.02 [-.12, .08]	-.03 [-.14, .07]	-.02 [-.12, .09]	.05 [-.06, .15]	.07 [-.03, .18]	-.00 [-.11, .10]	.16** [.06, .26]						
11. M_HIGH_NARC	2.53	1.02	-.02 [-.13, .08]	-.01 [-.11, .10]	-.00 [-.11, .10]	.03 [-.08, .13]	.03 [-.08, .13]	-.05 [-.15, .06]	-.02 [-.13, .08]	-.06 [-.16, .05]	.28** [.19, .37]	.43** [.34, .51]					
12. M_HIGH_MACH	2.41	1.11	-.07 [-.17, .04]	-.10 [-.20, .00]	-.01 [-.11, .10]	.11* [.00, .21]	.13* [.02, .23]	.03 [-.07, .14]	-.01 [-.11, .10]	-.10 [-.20, .00]	.42** [.33, .50]	.25** [.15, .34]	.28** [.18, .37]				
13. M_LOW_NARC	2.75	1.04	.02 [-.08, .13]	.01 [-.09, .11]	-.02 [-.12, .09]	.06 [-.04, .16]	.03 [-.07, .13]	.01 [-.09, .12]	-.02 [-.13, .08]	-.03 [-.14, .07]	.12* [.02, .22]	.40** [.31, .48]	.30** [.21, .39]	.19** [.09, .29]			
14. M_LOW_PSY	2.99	1.06	-.05 [-.15, .05]	-.05 [-.15, .05]	-.11* [-.21, -.01]	-.05 [-.15, .05]	-.00 [-.11, .10]	.05 [-.06, .15]	.06 [-.05, .16]	-.03 [-.14, .07]	.19** [.09, .29]	.36** [.27, .45]	.32** [.23, .41]	.10* [.00, .20]	.44** [.36, .52]		
15. M_HIGH_DT	8.09	2.41	-.06 [-.16, .04]	-.09 [-.19, .02]	-.01 [-.11, .09]	.11* [.01, .21]	.11* [.00, .21]	-.01 [-.12, .09]	-.01 [-.11, .10]	-.07 [-.17, .04]	.78** [.73, .81]	.37** [.28, .46]	.68** [.62, .73]	.77** [.73, .81]	.29** [.19, .38]	.28** [.18, .37]	
16. M_LOW_DT	8.03	2.40	-.06 [-.16, .05]	-.05 [-.15, .06]	-.08 [-.18, .03]	-.02 [-.13, .08]	-.01 [-.11, .10]	.05 [-.06, .15]	.03 [-.08, .13]	-.04 [-.15, .06]	.21** [.11, .30]	.75** [.70, .79]	.46** [.38, .54]	.23** [.13, .32]	.80** [.76, .83]	.78** [.74, .82]	.40** [.31, .48]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM =

Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; M_HIGH_PSY = Attractiveness ratings of face high in psychopathy; M_LOW_MACH = Attractiveness ratings of face low in Machiavellianism; M_HIGH_NARC = Attractiveness ratings of face high in narcissism; M_HIGH_MACH = Attractiveness ratings of face high in Machiavellianism; M_LOW_NARC = Attractiveness ratings of face low in narcissism; M_LOW_PSY = Attractiveness ratings of face low in psychopathy; M_HIGH_DT = Attractiveness ratings of faces high in Dark Triad; M_LOW_DT = Attractiveness ratings of faces low in Dark Triad. Only heterosexual and bisexual participants were included in analysis.

* indicates $p < .05$. ** indicates $p < .01$.

Table I2

Means, standard deviations, and correlations with confidence intervals of dark personality facets and facial attractiveness ratings of women in men

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. SRPIII_ITS	13.73	4.18															
2. SRPIII_ASB	9.56	3.81	.59** [.51, .66]														
3. SRPIII_IM	7.89	2.40	.57** [.49, .64]	.46** [.37, .54]													
4. NPI15_GRAND	11.31	3.98	.44** [.35, .53]	.24** [.13, .34]	.39** [.29, .48]												
5. NPI15_LEAD	21.57	6.31	.43** [.33, .51]	.14* [.03, .25]	.35** [.24, .44]	.68** [.62, .74]											
6. HSNS_OVERS	8.63	2.26	.03 [-.08, .15]	.05 [-.06, .16]	.05 [-.06, .16]	.23** [.13, .33]	.09 [-.02, .20]										
7. HSNS_EGO	4.58	1.43	.20** [.09, .31]	.11* [.00, .22]	.20** [.09, .30]	.16** [.05, .27]	.11* [.00, .22]	.25** [.15, .35]									
8. MACH	9.49	3.62	.11 [-.00, .22]	.04 [-.07, .15]	.23** [.12, .34]	.11* [.00, .22]	.15* [.03, .25]	.19** [.08, .29]	.42** [.32, .51]								
9. F_LOW_PSY	3.04	1.02	-.06 [-.17, .05]	-.01 [-.13, .10]	-.05 [-.16, .06]	-.07 [-.18, .04]	-.02 [-.13, .09]	-.03 [-.14, .08]	-.07 [-.18, .04]	-.16** [-.26, -.05]							
10. F_HIGH_NARC	3.29	1.08	-.04 [-.16, .07]	-.13* [-.24, -.02]	-.06 [-.17, .05]	-.08 [-.19, .03]	.00 [-.11, .12]	-.08 [-.19, .03]	-.16** [-.27, -.05]	-.07 [-.18, .04]	.38** [.28, .47]						
11. F_LOW_NARC	3.07	0.95	.02 [-.10, .13]	-.00 [-.11, .11]	-.04 [-.15, .07]	-.03 [-.14, .08]	.07 [-.04, .18]	-.02 [-.13, .09]	-.11 [-.21, .00]	-.05 [-.16, .06]	.48** [.40, .56]	.28** [.18, .38]					
12. F_LOW_MACH	3.05	0.99	-.05 [-.16, .06]	-.10 [-.21, .01]	-.11* [-.22, -.00]	-.10 [-.21, .01]	.05 [-.06, .17]	-.10 [-.21, .01]	-.10 [-.21, .01]	-.03 [-.14, .08]	.51** [.43, .59]	.44** [.34, .52]	.53** [.44, .60]				
13. F_HIGH_MACH	3.19	1.12	.04 [-.07, .15]	.01 [-.10, .13]	.01 [-.10, .12]	-.03 [-.14, .09]	-.01 [-.12, .10]	-.01 [-.12, .10]	-.13* [-.23, -.02]	-.11 [-.22, .00]	.28** [.18, .38]	.36** [.26, .45]	.27** [.16, .37]	.32** [.22, .42]			
14. F_HIGH_PSY	3.01	1.05	-.03 [-.14, .08]	-.10 [-.21, .01]	-.11 [-.22, .00]	-.11 [-.22, .00]	-.02 [-.13, .09]	-.06 [-.17, .05]	-.18** [-.28, -.07]	-.08 [-.19, .03]	.37** [.28, .47]	.46** [.37, .54]	.39** [.29, .48]	.40** [.31, .49]	.44** [.34, .52]		
15. F_HIGH_DT	9.49	2.56	-.02 [-.13, .09]	-.09 [-.20, .02]	-.07 [-.18, .04]	-.09 [-.20, .02]	-.01 [-.13, .10]	-.06 [-.17, .05]	-.20** [-.30, -.09]	-.11* [-.22, -.00]	.44** [.35, .53]	.77** [.73, .82]	.40** [.30, .49]	.50** [.41, .57]	.77** [.72, .81]	.80** [.76, .84]	
16. F_LOW_DT	9.15	2.42	-.04 [-.15, .07]	-.06 [-.17, .06]	-.09 [-.20, .02]	-.08 [-.19, .03]	.04 [-.07, .16]	-.07 [-.18, .04]	-.12* [-.23, -.01]	-.11 [-.22, .01]	.82** [.78, .85]	.46** [.37, .54]	.81** [.77, .85]	.83** [.80, .86]	.37** [.27, .46]	.48** [.39, .56]	.56** [.47, .63]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. SRPIII_ITS = Impulsive Thrill Seeking; SRPIII_ASB = Antisocial Behavior; SRPIII_IM = Interpersonal Manipulation; NPI15_GRAND = Grandiosity; NPI15_LEAD = Leadership personality; HSNS_OVERS = Oversensitivity; HSNS_EGO = Egocentrism; MACH = Machiavellianism; F_LOW_PSY = Attractiveness ratings of face low in psychopathy; F_HIGH_NARC = Attractiveness ratings of face high in narcissism; F_LOW_MACH = Attractiveness ratings of face low in Machiavellianism; F_HIGH_MACH = Attractiveness ratings of face high in Machiavellianism; F_LOW_NARC = Attractiveness ratings of face low in narcissism; F_HIGH_PSY = Attractiveness ratings of face high in psychopathy; F_HIGH_DT =

Attractiveness ratings of faces high in Dark Triad; F_LOW_DT = Attractiveness ratings of faces low in Dark Triad. Only heterosexual and bisexual participants were included in analysis.

* indicates $p < .05$. ** indicates $p < .01$.

Appendix J

Re-analyses of Structural Equation Models with alternative Estimators

Table J1 and J2 display results of all previous analyses of the factorial structure of dark personality, re-conducted with means and variance adjusted chi-square statistics and robust standard errors.

Table J1

Goodness- and badness-of-fit Indicators of confirmatory factor analysis investigating the factorial structure of dark personality

Model	χ^2	<i>df</i>	RMSEA	SRMR	CFI	TLI
One-factor model	4119.595***	989	0.070	0.105	0.566	0.546
Three-factor model	2274.563***	986	0.045	0.071	0.821	0.812
Six-factor model	2018.912***	974	0.041	0.063	0.855	0.846
Hierarchical Dark Triad model	2094.912***	981	0.042	0.066	0.846	0.837
Hierarchical Dark Core model	2786.007***	983	0.053	0.081	0.750	0.737

Note. $N = 652$. DWLS estimator with means and variance adjusted chi-square statistics and robust standard errors and items as a basic unit used.

*** $p < .001$.

Table J2

Model comparison with scaled chi-square difference test

Model comparison	$\Delta\chi^2$	Δdf
Six-factor model	-	-
One-factor model	755.29***	15
Three-factor model	161.13***	12
Hierarchical Dark Triad model	58.817***	7
Hierarchical Dark Core model	292.07***	9

Note. $N = 652$. DWLS estimator with means and variance adjusted chi-square statistics and robust standard errors and items as a basic unit used.

*** $p < .001$.

Appendix K

Abstracts of the Present Study in English and German

English abstract

Facets of dark personality traits are rarely used as predictors for relevant outcomes, although analysis on a facet level enhances differentiated interpretation of associations. Furthermore, previous research on the associations of dark personality and mating behavior is incoherent, the factorial structure of dark personality is still controversial and measurement invariance of questionnaires has not been thoroughly examined. The present study gives insights into the associations of dark personality and mating behavior, clarifies the factorial structure of dark personality using different statistical approaches and investigates the measurement invariance of German adaptations of well-established self-report questionnaires (Narcissistic Personality Inventory, Self-Report Psychopathy Scale and trimmed MACH). 749 participants (54% women, mean age = 34.28 years) filled out the present study's survey in a cross-sectional design including multiple scales measuring dark personality traits and mating behavior. Additionally, attractiveness of dark personality traits was investigated using facial and verbal attractiveness ratings. Confirmatory factor analysis and exploratory structural equation modelling suggested a three-factor model of dark personality. Residual invariance was shown for subgroups with different educational statuses and configural invariance was shown for gender groups. Dark personality facets were differentially related to infidelity and jealousy among men and women. Facets of secondary psychopathy and overt narcissism were important predictors in both sexes for all outcome variables, whereas covert narcissism showed significant associations with jealousy and intention towards infidelity only among men. Facial attractiveness ratings indicated similar attractiveness of high and low Dark Triad faces, whereas verbal attractiveness ratings indicated higher attractiveness of low Dark Triad description.

Keywords: Dark Triad, Narcissism, Machiavellianism, Psychopathy, Infidelity, Jealousy, Attractiveness, Confirmatory factor analysis, Exploratory structural equation modelling, Measurement invariance.

German Abstract

Facetten der Dunklen Triade werden selten als Prädiktoren für relevante Variablen untersucht, obwohl Analysen auf einer Facetten Ebene differenzierte Interpretationen von Zusammenhängen ermöglichen. Des Weiteren ist die Erforschung der Zusammenhänge von Dunkler Triade und menschlichem Paarungsverhalten inkohärent, die faktorielle Struktur von dunkler Persönlichkeit wird kontrovers diskutiert und die Messinvarianz von etablierten Fragebögen wurde noch nicht eingehend untersucht. Die vorliegende Studie untersucht Zusammenhänge zwischen Facetten der Dunklen Triade und menschlichem Paarungsverhalten, die Faktorenstruktur dunkler Persönlichkeitseigenschaften und prüft die Messinvarianz von deutschen Übersetzungen etablierter Selbstbeurteilungsfragebögen. 749 Studienteilnehmer/Innen (54 % Frauen, im Durchschnitt 34.28 Jahre alt) füllten die Befragung der vorliegenden Querschnittsstudie aus. Mehrere Skalen zur Dunklen Triade und menschlichen Paarungsverhalten wurden vorgegeben. Außerdem wurde die Attraktivität dunkler Persönlichkeitseigenschaften mit Hilfe verbaler und piktorialer Stimuli erfasst. Konfirmatorische Faktorenanalysen und explorative Strukturgleichungsmodelle ergaben ein Drei-Faktoren-Modell von dunklen Persönlichkeitseigenschaften. Residuale Invarianz konnte für Subgruppen mit unterschiedlichen Bildungsstatus und konfigurale Invarianz für Geschlechtergruppen gezeigt werden. Facetten der Dunklen Triade zeigten bei Männern und Frauen unterschiedliche Zusammenhänge mit Untreue und Eifersucht. Sekundäre Psychopathie und offene Formen des Narzissmus waren wichtige Prädiktoren bei beiden Geschlechtern. Nur bei Männern zeigten verdeckte Formen des Narzissmus signifikante Assoziationen mit Eifersucht und der Intention Untreu zu werden. Verbale Attraktivitätsbewertungen zeigten eine höhere Attraktivität von Personen mit geringen Ausprägungen der Dunklen Triade. Attraktivitätsbewertungen mit piktorialen Stimuli zeigte eine ähnlich hohe Attraktivität von Gesichtern mit geringen und hohen Ausprägungen in der Dunklen Triade.

Schlüsselwörter: Dunkle Triade, Narzissmus, Machiavellismus, Psychopathie, Untreue, Eifersucht, Attraktivität, Konfirmatorische Faktorenanalyse, explorative Strukturgleichungsmodelle, Messinvarianz.