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Social media use and personality: Beyond self-reports and trait-level assessments

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ABSTRACT

We investigated how objective, behavioral data on social media use was correlated with the Dark Tetrad facets and the HEXACO traits. We tracked usage time and usage session of social media users ($N = 243$), considering Instagram to be a visual social medium compared to Facebook and, therefore, to be related to “dark” personality characteristics (i.e., short-term mating, antisocial attitudes). Additional to bivariate correlations, we controlled the Dark Tetrad facets for the HEXACO model and vice versa using partial correlations, and found that agentic extraversion, self-entered antagonism, and Machiavellian tactics, but not the HEXACO traits, were correlated with Instagram usage time and sessions. We observed no personality correlations with Facebook use. In women, more facets were associated with Instagram use, while in men only boldness was linked to it. We discuss the findings in the light of short-term mating and antisocial behavior on social media (e.g., niche specialization, cyberstalking). Disentangling the Dark Tetrad traits helped refine previous findings.

Which personality characteristics drive the 4.7B social media users to spend their time online (Statista, 2022b)? While there is no shortage of research on the links between personality and the psychology around the use of social media applications (Fox & Rooney, 2015; Huang, 2019), the research in this area, like that of psychology in general may have become a science of self-reported behaviors (Baumeister, Vohs, & Funder, 2007) when there might be ways to capture people's online behavior more objectively (Appel, Marker, & Gnambs, 2020). Self-reports may underestimate usage time (Jürgens, Stark, & Magin, 2020), and increasingly differ for heavy-users compared to behavioral smartphone data, which show an increase in screen time since the beginning of the COVID-19 crisis (Hodes & Thomas, 2021). Facebook and Instagram are the most used social media platforms (Statista, 2022a). Nonetheless most research using behavioral data is done on Twitter (i.e., investigating exported text-blocks), covering as much research as Facebook and Instagram together (Singh, Halgamuge, & Moses, 2019). Instagram is popular among younger users and concentrated around user-generated visual content compared to Facebook, initially the most researched social media platform (Marengo, Longobardi, Fabris, & Settanni, 2018). In contrast to text-based platforms like Twitter, visual-based social media are used to present one's sexual availability and attractiveness (Fox & Rooney, 2015), both short-term

mating characteristics, typically associated with the Dark Tetrad traits (i.e., narcissism, Machiavellianism, psychopathy, sadism) besides anti-social manifestations (Furnham, Richards, & Paulhus, 2013; Jonason, Li, Webster, & Schmitt, 2009). Individuals high in the dark traits engage in several forms of deceptive mating tactics (Jonason, Lyons, Baughman, & Vernon, 2014) they likely use on social media too. For instance, individuals high in vulnerable narcissism and Machiavellianism misrepresent themselves on Instagram (Geary, March, & Grieve, 2021), as do individuals high in vulnerable narcissism on Facebook (Grieve, March, & Watkinson, 2020).

Vulnerable narcissism is one of the characteristics of the trait narcissism. Referring to the unique facets of the Dark Tetrad traits, narcissism consists of *agentic extraversion* (i.e., immodest, assertive), *antagonism* (i.e., entitlement, arrogance), and *neuroticism* (i.e., emotionally vulnerable; Miller, Vize, Crowe, & Lynam, 2019). Machiavellianism includes *tactics* (i.e., reaching agentic goals) and *cynical views* (i.e., exploitative attitudes; Monaghan, Bizumic, Williams, & Sellbom, 2020). The triarchic model of psychopathy comprises *meanness* (i.e., lack of empathy), *boldness* (i.e., reckless, impertinent), and *disinhibition* (i.e., impulsive, Međedović & Damjanović, 2018). Sadism is described as pleasure when hurting others *verbally*, *physically*, or *indirect* (Buckels & Paulhus, 2014). These “dark” traits are associated with more social

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media usage time, although for different purposes. For example, narcissists present themselves, whereas Machiavellians and psychopaths check their sexual and romantic partners online (Fox & Rooney, 2015; Stiff, 2019). Previous interpretations indicate that these associations are based on grandiose narcissism, Machiavellian tactics, and psychopathic impulsivity (e.g., Appel et al., 2020; Fox & Rooney, 2015; Freyth & Batinic, 2021). Research on facets and time-intensive social media behaviors (e.g., inauthentic Instagram self-presentations, phubbing) found links with vulnerable narcissism, first (i.e., callousness) psychopathy, second psychopathy (i.e., impulsivity; Geary et al., 2021), and vulnerable narcissism (Grieve & March, 2021). Everyday sadism is associated with antisocial online behaviors on top of the Dark Triad traits (e.g., cyberstalking, technology facilitated infidelity, cyberbullying; Moor & Anderson, 2019). Worth mentioning is the differentiation of the time spend on the apps and the number of times the app was opened (e.g., to check some likes or messages) by relying on objective measures. This is important as people who care less about others more interested in self-referential information and feedback tend to check their phone more frequently (Grieve & March, 2021).

On other visual, short-term mating oriented social media such as dating apps, these dark traits are better predictors of use than the Big Five traits (Freyth & Batinic, 2021). Here might lie the missing link on inconsistent findings on the Big Five traits and social media use except for extraversion (Huang, 2019; Liu & Campbell, 2017): the HEXACO traits, especially honesty-humility, could provide incremental contributions of dark facets beyond standard taxonomies of personality like the Big Five (Moshagen, Hilbig, & Zettler, 2018). So, associations with social media use can be challenged and worked out more precisely comparing the two collections of traits. Of note, work on the dark traits is partly limited because the often-used narrow short scales (Muris, Merckelbach, Otgaar, & Meijer, 2017) like the Dirty Dozen (Jonason & Webster, 2010) and the Short Dark Triad (Jones & Paulhus, 2014), we overcome by investigating lower-order traits, or facets.

Therefore, we conduct one of the few studies on physical behaviors on people's Instagram and Facebook use in relation to lower order aspects of the HEXACO and the Dark Tetrad traits. We expect a relationship between the Dark Tetrad facets and Instagram use (i.e., time and sessions), but not between the Dark Tetrad traits and Facebook use because of the visual character of the former (Marengo et al., 2018), attracting short-term mating-oriented individuals (Fox & Rooney, 2015; Jonason et al., 2009). Additionally, we expect the same correlations for honesty-humility and extraversion (Liu & Campbell, 2017) with Instagram-but not Facebook-use yet not to other HEXACO, traits because we think that the short-term mating orientation of the dark traits (Jonason et al., 2009), honesty-humility (Moshagen et al., 2018), and extraversion (Nettle, 2005) is the essential link. In detail, we expect a relationship between agentic extraversion (*H1a*), vulnerable narcissism (*H1b*), Machiavellian tactics (*H2*) and Instagram usage time and sessions. We expect meanness (*H3a*) to correlate with usage time (Geary et al., 2021), while impulsivity (*H3b*) should be correlated with usage sessions as people need to check their phone frequently (see phubbing; Grieve & March, 2021). We expect indirect sadism (*H4*) but not verbal or physical sadism to be correlated with Instagram usage time and sessions as antisocial online behaviors do not occur offline, although they might have offline consequences (Moor & Anderson, 2019).

1. Methods

1.1. Participants and procedures

Data was collected by an online-panel (i.e., Respondi) of German-speaking respondents, remunerated for their participation (4€) that tracked usage data of Instagram and Facebook of the last three months. Participants were invited via the company's online system using two redirect-links, synchronizing the invitations with the anonymized user IDs to limit the sample to the invited, tracked users by rejecting all

external accesses (i.e., uninvited users or bots). We received the summed data for the captured time by the company, including both Android and iOS users. We recruited 291 participants, 243 (Men = 138, Women = 105) aged ($M = 42.81$, $SD = 14.28$) who used Instagram and/or Facebook (56 unique Facebook users, 20 unique Instagram users) and satisfactorily completed the survey which was an adequate amount to detect medium-sized effects ($f^2 = 0.15$, $\alpha = 0.05$; Cohen, 1992). Ethical clearance was obtained by Johannes Kepler University Linz, participants were informed of the nature of the study, completed a series of online questionnaires that were paired by the panel company with the usage data, debriefed, and thanked for their participation. Part of the ethical clearance was not to use a forced-choice format of the questions.

1.2. Data cleaning

After observing low McDonald's ω for the HEXACO traits ($\omega_{raw} = 0.50/0.35/0.54/0.20/0.39/0.58$), we checked for suspicious response patterns (i.e., always giving the response overall or in the same block, missing answers) and decided for a conservative approach. We finally removed 48 participants, improving internal consistency of the HEXACO traits but slightly decreasing the Dark Tetrad scores, while results remained stable before and after data cleaning. Scores were comparable to those in the scale's publication (de Vries, 2013) likely a result of the heterogeneity within the item selection (Rammstedt & Beierlein, 2014) and therefore provide a broad content coverage (Schmitt, 1996) (further details in the supplements).

1.3. Design

After reporting descriptive statistics, we test our hypotheses using bivariate correlations. We report zero-order correlations for each sex, and then test for moderations by sex as suggested for work on the Dark Triad/Tetrad traits (Jonason et al., 2009; Jonason & Webster, 2010). Then we use partialled correlations to report the overall correlations after removing the shared variance with HEXACO traits from the Dark Tetrad facets and vice versa. Last, to test for interactional and separate effects of sex and app use, we run a series of 2 (sex) \times 3 (user of Instagram, Facebook, or both) ANOVAs using 17 traits as dependent variables.

1.4. Measures

Social media behaviors were measured usage intensity by app usage time (i.e., how long was the app opened per day) and sessions (i.e., how often was the app opened per day). Participants had an app installed, which captured the active app (full-screen) every second; a session was defined as having the app opened for at least 5 s. Usage time in minutes (Instagram: $M(SD) = 18.22(21.78)$, $Mdn = 8.52$, Skew = 1.76, Kurtosis = 2.47; Facebook: $M(SD) = 23.68(29.38)$, $Mdn = 16.50$, Skew = 4.29, Kurtosis = 29.16) and sessions (Instagram: $M(SD) = 8.50(10.16)$, $Mdn = 4.18$, Skew = 1.99, Kurtosis = 3.52; Facebook: $M(SD) = 11.23(21.71)$, $Mdn = 5.13$, Skew = 7.01, Kurtosis = 62.33) were positively skewed count data leading us to natural log-transform them for analyses.

We measured narcissism in three forms (i.e., agentic extraversion, self-centered antagonism, neurotic narcissism; see Crowe, Lynam, Campbell, & Miller, 2019), of which German, validated versions were available. Participants reported their agreement (1 = *totally disagree*; 6 = *totally agree*) with items like "I am great" (i.e., agentic extraversion, 9 items, $\omega = 0.87$; Back et al., 2013, subscale admiration), "I want my rivals to fail" (i.e., self-centered antagonism, 9 items, $\omega = 0.89$; Back et al., 2013, subscale rivalry), and "When people criticize me, I get embarrassed" (i.e., neurotic narcissism, 4 items, $\omega = 0.84$; Glover, Miller, Lynam, Crego, & Widiger, 2012, subscale need for admiration). Items were averaged to build scores.

We measured two manifestations of Machiavellianism with the 12-item Two-Dimensional Machiavellianism Scale (Monaghan et al.,

2020). Participants reported their agreement (1 = *disagree strongly*; 7 = *agree strongly*) with items capturing Machiavellian views (e.g., “In my opinion, human nature is to be dishonest”, $\omega = 0.67$) and Machiavellian tactics (e.g., “I think that it is OK to be unethical for the greater good”, $\omega = 0.69$). No validated German version of the scale was available at the time of the study, so three bilingual speakers forward and back translated the items. The corresponding items were averaged to create indexes.

Individual differences in psychopathy were measured with a German Version (forward and back translated) the Triarchic Psychopathy Scale (Mededović & Damjanović, 2018). Participants reported how characteristic (1 = *not at all*; 4 = *very*) 15 statements reflected their meanness (e.g., “I don’t have much sympathy for people”, $\omega = 0.51$), boldness (e.g., “I’m a born leader”, $\omega = 0.68$), and disinhibition (e.g., “I jump into things without thinking.”, $\omega = 0.73$). Items were averaged to build scores.

We measured individual differences in sadism with the German translation (Voggeser & Göritz, 2020) of the Short Comprehensive Assessment of Sadistic Tendencies scale (Buckels & Paulhus, 2014). It is composed of nine items (three per trait). Participants rated their agreement (1 = *disagree strongly*, 5 = *agree strongly*) with statements capturing verbal (e.g., “I was purposely mean to some people in high school.”, $\omega = 0.83$), physical (e.g., “I enjoy tormenting people”, $\omega = 0.88$), and indirect (e.g., “I sometimes replay my favorite scenes from gory slasher films.”, $\omega = 0.87$) sadism. To build indexes the corresponding items were averaged.

To measure the HEXACO traits we used a German version of the Brief HEXACO Inventory (de Vries, 2013). It is composed of 24 items (four per trait) where participants rate their agreement (1 = *totally disagree*; 7 = *totally agree*) on items capturing honesty-humility (e.g., “I want to be famous”, $\omega = 0.50$), emotionality (e.g., “I worry less than others”, $\omega = 0.43$), extraversion (e.g., “I easily approach strangers”, $\omega = 0.60$), agreeableness (e.g., “I often express criticism”, $\omega = 0.45$), conscientiousness (e.g., “I work very precisely”, $\omega = 0.53$), and openness (e.g., “I think science is boring”, $\alpha = 0.51$). The Items were averaged to build scores.

2. Results

We report descriptive statistics in Table 1. Men scored higher in neurotic narcissism, Machiavellian tactics, meanness, boldness, disinhibition, verbal sadism, physical sadism, indirect sadism, and openness than women. Women used Instagram longer and more frequently than men did, used Facebook more frequently, and reported higher honesty-humility, emotionality, and conscientiousness than men.

Individuals high in self-centered antagonism were associated with more Instagram usage time and sessions (Table 2). Being a man characterized by boldness and openness was related to more Instagram usage time, while meanness in men was related to less usage time. Women high in self-centered antagonism, neurotic narcissism, Machiavellian views, Machiavellian tactics, disinhibition, physical and indirect sadism used Instagram for more time and had more sessions, extraverted women had less sessions. Machiavellian views were associated with more Facebook sessions overall and in men. Agentic extraversion was associated with less Facebook usage time among men and with more usage sessions among women.

Next, we tested the correlations for moderation by sex using Fisher’s z -test. Women characterized by high self-centered antagonism, neurotic narcissism, Machiavellian views, Machiavellian tactics, meanness, disinhibition, physical sadism, and indirect sadism used Instagram for a longer time and more frequently than did men. In women verbal sadism and emotionality was associated with a longer, honesty-humility and conscientiousness with a shorter Facebook usage time compared to men. Extraverted women used Instagram more frequently than men did. Further, women high in agentic extraversion and indirect sadism used Facebook for a longer time and more frequently than men. Women high

Table 1

Descriptive statistics for the personality and social media use ($N = 243$).

	$M(SD)$	$\delta M(SD)$	$\varphi M(SD)$	t	d
Agentic extraversion	3.00 (0.98)	3.09 (0.96)	2.89 (0.99)	-1.67 [†]	-0.22
Self-centered antagonism	3.09 (0.95)	2.89 (0.86)	3.23 (1.04)	1.94 [†]	0.25
Neurotic narcissism	2.17 (1.05)	2.35 (1.04)	1.94 (1.02)	-3.02**	-0.39
Machiavellian views	3.44 (1.12)	3.53 (1.20)	3.33 (0.99)	-1.42	-0.18
Machiavellian tactics	2.85 (1.11)	3.00 (1.14)	2.65 (1.06)	-2.46*	-0.32
Meanness	2.00 (0.51)	2.06 (0.52)	1.92 (0.48)	-2.06*	-0.27
Boldness	2.38 (0.64)	2.46 (0.61)	2.28 (0.66)	-2.16*	-0.28
Disinhibition	1.82 (0.63)	1.91 (0.65)	1.71 (0.60)	-2.36*	-0.31
Verbal sadism	2.07 (1.02)	2.28 (1.01)	1.80 (0.96)	-3.77**	-0.49
Physical sadism	1.40 (0.82)	1.53 (0.94)	1.23 (0.59)	-2.92**	-0.38
Indirect sadism	1.59 (0.94)	1.81 (1.01)	1.30 (0.76)	-4.40**	-0.57
Honesty-humility	3.73 (0.69)	3.63 (0.66)	3.87 (0.70)	2.74**	0.35
Emotionality	3.20 (0.66)	3.01 (0.64)	3.45 (0.60)	5.42**	0.70
Extraversion	3.67 (0.70)	3.62 (0.72)	3.74 (0.66)	1.32	0.17
Agreeableness	3.01 (0.60)	3.03 (0.60)	2.98 (0.59)	-0.67	-0.09
Conscientiousness	3.60 (0.65)	3.53 (0.70)	3.70 (0.58)	2.06*	0.27
Openness	3.51 (0.68)	3.61 (0.66)	3.39 (0.69)	-2.55*	-0.33
Instagram duration	2.15 (1.40)	1.86 (1.28)	2.52 (1.46)	2.86**	0.48
Instagram sessions	1.57 (1.04)	1.31 (0.86)	1.92 (1.16)	3.61**	0.61
Facebook duration	2.46 (1.43)	2.40 (1.30)	2.54 (1.59)	0.68	0.10
Facebook sessions	1.77 (1.05)	1.63 (1.00)	1.96 (1.09)	2.09*	0.32

Note. men = 1, women = 0.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.

in physical sadism used Facebook for a longer, those high in openness for a shorter time than men.

Given the correlations between the Dark Tetrad facets and the HEXACO traits we removed either the shared variance of the dark traits or the HEXACO traits and report partialled correlations.¹ After removing the shared variance of the HEXACO model, self-centered antagonism, Machiavellian tactics, and boldness were associated with more Instagram usage time and sessions, and agentic extraversion was associated with more Instagram usage time.

Last, we ran a series of 2 (sex) \times 3 (user of Instagram, Facebook, or both) ANOVAs using 17 traits as dependent variables. We found an overall effect for sex ($F[1, 242] = 3.47, p < .01, \eta_p^2 = 0.21$), replicating previously reported sex differences (e.g., women higher in honesty-humility, men higher in boldness; for further see Table 1). We found no overall interactions, but one interaction for emotionality ($F[2, 241] = 3.60, p < .01, \eta_p^2 = 0.22$), indicating that women using Instagram or both apps are higher in emotionality than men, who score lower on emotionality when using only Instagram or both apps instead of

¹ Because our sample size was insufficient for using hierarchical regressions (20 individuals per cell; Simmons et al., 2011), we used partialled correlations.

Table 2
Correlations for traits and Instagram and Facebook use (sessions and time, both nat-log-transformed) overall ($r/r_{\text{partialled}}$) and men/women (δ/φ).

	Instagram					
	Time			Sessions		
	Overall ($r/r_{\text{partialled}}$)	δ/φ	z	Overall ($r/r_{\text{partialled}}$)	δ/φ	z
Agentic extraversion	0.13 [†] /0.17*	0.18/0.14	0.31	0.06/0.08	0.08/0.10	0.15
Self-centered antagonism	0.27**/0.24**	0.05/0.44**	-3.22**	32**/0.29**	0.14/0.42**	-2.34*
Neurotic narcissism	0.01/0.04	-0.14/0.25*	-3.02**	0.07/0.05	-0.07/0.29*	-2.81**
Machiavellian views	-0.03/-0.01	-0.13/0.18	-2.38*	0.04/0.01	-0.05/23 [†]	-2.17*
Machiavellian tactics	0.04/0.13 [†]	-0.10/28*	-2.96**	0.15 [†] /19*	0.05/0.34**	-2.32*
Meanness	-0.11/-0.07	-0.25 [†] /0.16	-3.18**	-0.05/-0.07	-0.18/0.18	2.77**
Boldness	0.12/0.18*	0.24 [†] /0.06	1.41	0.11/0.17*	0.27 [†] /0.04	-0.47
Disinhibition	0.03/0.02	-0.08/0.22 [†]	-2.32*	0.07/0.04	-0.02/0.25*	-2.10*
Verbal sadism	-0.06/-0.04	-0.19/23 [†]	-3.25**	0.05/0.05	0.05/0.23 [†]	-1.40
Physical sadism	-0.05/-0.02	-0.21 [†] /0.23 [†]	-3.41**	<0.01/-0.01	-0.14/0.26*	-3.13*
Indirect sadism	0.02/0.12	-0.05/0.24 [†]	-2.25*	0.06/0.09	-0.03/0.30*	-2.59**
Honesty-humility	0.07/0.15 [†]	0.18/-0.08	2.00*	-0.01/0.09	0.01/-0.08	0.69
Emotionality	0.08/0.05	-0.17/0.18	-2.70**	0.11/0.07	-0.08/0.06	-1.07
Extraversion	-0.03/-0.09	0.09/-0.22 [†]	1.02	-0.07/0.08	0.10/-0.31*	3.21**
Agreeableness	0.01/-0.06	0.07/-0.14	1.61	-0.02/-0.02	-0.08/-0.07	-0.08
Conscientiousness	0.01/0.04	0.10/-0.15	2.07*	-0.02/0.06	0.02/-0.12	1.07
Openness	0.16 [†] /0.09	0.31*/0.11	1.60	0.05/0.01	0.12/0.11	0.08
	Facebook					
Agentic extraversion	-0.09/-0.07	-0.22*/0.07	-2.24*	0.03/0.02	-0.11/0.23*	-2.63**
Self-centered antagonism	-0.10/-0.13 [†]	-0.05/-0.16	0.85	-0.04/-0.02	0.04/-0.17	-1.00
Neurotic narcissism	0.04/-0.01	-0.06/0.17	-1.77 [†]	0.05/0.04	0.08/0.10	-0.15
Machiavellian views	0.12/0.06	0.13/0.13	0.00	0.15*/0.13 [†]	0.20*/0.11	0.70
Machiavellian tactics	<0.01/-0.04	-0.01/0.04	-0.38	0.04/<0.01	0.08/0.05	0.23
Meanness	0.14 [†] /0.10	0.05/29*	-1.89 [†]	0.09/0.05	0.10/0.13	-0.23
Boldness	<0.01/0.03	0.01/0.01	0.00	0.09/0.05	0.07/0.15	-0.62
Disinhibition	0.01/-0.05	-0.04/0.08	-0.92	0.02/<0.01	0.03/0.05	-0.15
Verbal sadism	0.05/0.01	-0.05/0.18	-1.77 [†]	0.06/-0.03	0.03/0.17	-1.08
Physical sadism	-0.05/-0.10	-0.14/0.13	-2.07*	-0.04/-0.08	-0.10/0.15	-1.92 [†]
Indirect sadism	-0.04/-0.09	-0.16/0.14	-2.30*	-0.04/-0.09	-0.12/0.16	-2.15*
Honesty-humility	<0.01/<0.01	0.10/-0.12	1.68 [†]	-0.06/-0.03	-0.02/-0.15	1.00
Emotionality	<0.01/0.04	-0.09/0.07	-1.22	-0.04/0.01	-0.07/-0.16	0.70
Extraversion	-0.07/-0.02	-0.13/<0.01	-1.00	0.04/0.08	-0.02/0.09	-0.84
Agreeableness	-0.11/-0.02	-0.02/-0.22 [†]	1.55	-0.11/-0.03	-0.09/-0.11	0.15
Conscientiousness	-0.07/-0.07	-0.05/-0.11	0.46	<0.01/0.01	-0.09/0.09	-1.38
Openness	-0.09/-0.03	0.04/-0.22 [†]	2.01*	-0.10/-0.09	-0.03/-0.15	0.92

Note. Correlation between time and session $r_{\text{Instagram}} = 0.80$, $r_{\text{Facebook}} = 0.74$; z is Fisher's z to compare independent correlations, calculated online (<http://quantpsy.org/corrttest/corrttest.htm>).

[†] $p < .10$.
* $p < .05$.
** $p < .01$.

Facebook only.

3. Discussion

Previous research on personality and social media use has at least two shortcomings. It relied mainly on self-reported data of social media use and analyzed either the Dark Triad traits or the Big Five traits, which made it hard to uncover exact associations and to compare both. Thus, we correlated behavioral data of the two largest social networks—Instagram and Facebook—with the Dark Tetrad facets and the HEXACO traits instead of the Dark Triad and the Big Five traits to refine previous research.

In general, the Dark Tetrad facets—but not the HEXACO traits—were associated with Instagram use. Whereas both taxonomies were almost completely uncorrelated with Facebook use. These findings were underlined by the partialled correlations, confirming *H1* partially (i.e., agentic extraversion, neurotic narcissism; *H1a* for time but not for sessions) and *H2* (i.e., Machiavellian tactics), but not *H3* (i.e., meanness, disinhibition) and *H4* (i.e., indirect sadism). We observed a different pattern among women in whom numerous dark facets showed stronger associations with Instagram usage time and particularly sessions—confirming *H1b*, *H2*, *H3b*, and *H4* only for women, whereas only bold men used Instagram longer and more frequently. This supports the

difference of Instagram of a highly visual social media app (Marengo et al., 2018) when compared to Facebook, which developed into a general platform with different interactions and more text-based interactions. Indicating, the link between Instagram use and the Dark Tetrad facets supports the assumption of using mating tactics on visual social media such as Instagram but not on Facebook. Interestingly, we could not identify an overall link between disinhibition and Instagram usage time or sessions (rejecting *H3*, limiting *H3b* to women). Probably our outcome markers did not match with previous ones, or objective Instagram data did not match the concrete behavior (e.g., phubbing; Grieve & March, 2021). What we could find was a relationship between Instagram use and indirect sadism, but only in women. This might be a consequence of antisocial online behaviors (Moor & Anderson, 2019), or more specific—a result of intimate partner cyberstalking, a mating strategy to avoid mating mistakes (March, Szymczak, Di Rago, & Jonason, 2022).

Relationships between personality and social media usage intensity were almost completely limited to the Dark Tetrad facets. Probably, because high-scoring individuals are looking for mating purposes online (Fox & Rooney, 2015) and prefer the environment because of more possible mating success there (i.e., better fitness pay-offs, niche specialization; Penke & Jokela, 2016). Remarkable, exploitative, callous men (i.e., meanness; Jonason et al., 2009) spend less time online, while

mild (i.e., boldness) psychopathic tactics (Jonason et al., 2014) are associated with more time spent and sessions on Instagram. Along with this, highly emotional women, use Instagram for a longer time than men, highlighting potential tactics used in this visual social media. Noteworthy, several facets were only linked to increased usage in women (e.g., self-centered antagonism), a finding that could be interpreted as mating tactics in modern, liberal societies with smaller sex differences. Particularly as we provide a German and not Anglo-American sample (Schmitt, 2005). Future researchers should investigate if visual social media might provide a safe environment for women to engage in (more) short-term mating (Baranowski & Hecht, 2015). These and general, upcoming challenges for society might emerge as usage time increases (Hodes & Thomas, 2021).

3.1. Limitations and conclusions

Despite our use of a tracked sample of sufficient size, our study has several limitations. Different Dark Tetrad facets could be chosen, yet we consider the ones picked best for an independent and holistic view of the taxonomy. This way, we could refine results on everyday sadism (Moor & Anderson, 2019), but the link between Instagram usage times and sessions with physical sadism instead of indirect sadism—in women and not in men—needs further investigation. Future research should investigate sex differences in personality and associated objective social media use with larger sample sizes to clarify our observed tendencies. Low internal consistency scores of the HEXACO traits are common among short scales, especially when using heterogeneous items (Rammstedt & Beierlein, 2014) to measure a complex but unidimensional construct or trait (Schmitt, 1996). However, we would suggest using long-versions for further research. Last, we only captured usage intensity objectively, upcoming research should investigate people's concrete behaviors on top and combine them with intensity and personality for analyses. And those studies should use experimental designs.

We show the importance of disentangling the Dark Tetrad traits when trying to understand their role in understanding objective social media use. Visual social media was used more intensely by people high in agentic extraversion, self-centered antagonism, and Machiavellian tactics but not by mean or impulsive individuals. Sex differences were not only observed in personality, but manifested in associated usage, too. While women with high Dark Tetrad facets used Instagram more intensely, only bold men did. The use of Instagram, as a visual social media, differs substantially from Facebook use regarding its users' personality characteristics, potentially for mating purposes on top of solely antisocial online behaviors. The findings are consistent with and sharpen previous research as only the Dark Tetrad traits, not the HEXACO traits, were associated with visual social media use. Like light attracts moths, social media seems to attract antisocial personalities.

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CRediT authorship contribution statement

Lennart Freyth: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Bernad Batinic:** Supervision, Project administration, Funding acquisition. **Peter K. Jonason:** Methodology, Data curation, Writing – review & editing, Visualization, Supervision.

Data availability

The data that has been used is confidential.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2022.111960>.

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