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A preliminary but methodologically improved investigation of the relationships between major personality dimensions and human ejaculate quality

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ABSTRACT

Some research has reported relationships between personality dimensions and ejaculate quality, but this research has methodological limitations. In the current study, we investigated the relationships between six major personality dimensions and ejaculate quality in a design that offered several methodological improvements over previous research. Forty-five fertile men provided two masturbatory ejaculates and completed a measure of personality (HEXACO-60) assessing honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience. Agreeableness was the only personality dimension associated with ejaculate quality, after controlling statistically for participant age, Body Mass Index (BMI), and abstinence duration, and this association was negative. However, once the covariates of BMI, age, and abstinence duration were included in a hierarchical regression (along with the six personality dimensions), agreeableness was no longer a statistically significant predictor of ejaculate quality, although the direction of the relationship remained negative. The current study adds to previous research documenting that psychological attributes—including major dimensions of personality—may be associated with ejaculate quality. We highlight limitations of the current research and identify directions for future study.

1. Introduction

Guided by a clinical interest in addressing male fertility challenges, considerable research has investigated the relationships between psychological attributes and male fertility (reviewed by Li, Lin, Li, and Cao, 2011). *Ejaculate quality* is a measure of fertility that includes sperm motility, count, concentration, velocity, and morphology (Cooper et al., 2010). Ejaculate quality is associated with several psychological individual differences, including well-being (Zorn, Auger, Velikonja, Kolbezen, and Meden-Vrtovec, 2008), intelligence (Arden, Gottfredson, Miller, & Pierce, 2009), and stress (Li et al., 2011). One class of individual differences that has received less attention in the ejaculate quality literature, however, is personality. In the current study, we investigate the relationships between personality dimensions and ejaculate quality.

Some research has investigated the relationships between personality dimensions and ejaculate quality, as part of a broader clinical effort to address male fertility challenges. Much of this research is empirically exploratory in service of clinical solutions, rather than guided by a particular theoretical framework. For example, Hellhammer, Hubert, Freischem, and Nieschlag (1985) documented that sperm count and motility are negatively associated with self-confidence, extraversion, and social assertiveness. Conrad et al. (2002) reported that sperm motility and morphology are negatively associated with extraversion, anxiety, and psychoticism. Pook, Tuschen-Caffier, Kubek, Schill, and Krause (2005) found that sperm concentration is negatively associated with conscientiousness. Previous research has suggested several potential explanations for these associations between personality dimensions and ejaculate quality. For example, neurons and spermatozoa have higher concentrations of polyunsaturated fatty acids compared to other body tissues, and these acids have important metabolic roles in neurodevelopment (Lauritzen et al., 2000) and spermatogenesis (Lenzi, Picardo, Gandini, & Dondero, 1996). Biochemical regulations of polyunsaturated fatty acids may therefore underlie the associations between psychological attributes—including personality dimensions—and ejaculate quality (Arden et al., 2008). Alternatively,

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conscientiousness and extraversion are positively associated with active coping (Hellhammer et al., 1985; Pook et al., 2005), and coping responses to chronic stress produce adrenergic activations in the central and peripheral nervous system (Pook et al., 2005). Adrenergic activations release adrenaline and noradrenaline, which constrict testicular blood vessels, thus suppressing the ability of the Leydig cells to produce testosterone and, ultimately, inhibiting activities related to spermatogenesis (Pook et al., 2005). Taken together, these results are consistent with the hypothesis that conscientiousness and extraversion are associated with active coping, which, in turn, interferes with spermatogenesis.

Previous studies investigating associations between ejaculate quality and personality dimensions have several limitations, however. First, many studies relied on data secured at a single assessment (e.g., Conrad et al., 2002), but many ejaculate parameters show considerable within-participant variability (e.g., Mallidis, Howard, & Baker, 1991). Second, previous research relied on data from men with known fertility pathology—for example, varicocele, orchidopexy, and prostatitis (e.g., Hellhammer et al., 1985). These pathologies affect spermatogenesis and related processes, leading to an inability to confidently generalize to fertile populations. Third, previous research reported associations of ejaculate quality with only a few individual personality traits (Pook et al., 2005) and has not investigated associations of ejaculate quality with a broad and comprehensive assessment of personality variation.

In the current research, we investigate the relationships between major personality dimensions and ejaculate quality. Specifically, we attempt to replicate results reported by previous research—for example, negative associations between ejaculate quality and extraversion (Conrad et al., 2002) and conscientiousness (Pook et al., 2005)—by addressing several limitations of this previous research. We investigate the relationships between the six major dimensions of personality variation identified by the HEXACO model (i.e., honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness to experience; Ashton and Lee, 2009) and ejaculate quality by securing multiple ejaculates from each participant in a sample of non-vasectomized young adult men with no history of infertility. The HEXACO measure affords a broader, more inclusive assessment of major personality dimensions, thereby casting a wider empirical net than was possible in previous research that relied on narrower, less inclusive measures of personality dimensions (e.g., Conrad et al., 2002; Pook et al., 2005; see Ashton and Lee, 2009). If adrenergic activation of the nervous system is regulated by active coping, and thus certain personality dimensions, and if this, in turn, affects spermatogenesis, then negative associations between such personality dimensions and ejaculate quality should generalize to a normal fertility sample.

2. Method

2.1. Participants

The current study reports novel analyses of a subset of data from a larger project (Pham et al., 2018). The original dataset included responses from 66 men, with ages ranging 18–34 years (M = 22.77; SD = 3.83; individuals were not screened for pre-existing conditions, such as psychopathology or special educational needs). Only data from men who provided two ejaculate samples (see Procedures) were included in the current analyses. The final sample included 45 men, aged between 18 and 33 years (M = 23.3; SD = 3.6; see Pham et al., 2018). Participants had not had a vasectomy, had never sought treatment for infertility, and were currently in a committed, heterosexual, sexually active relationship for at least six months (range 6–123 months; M = 35.5; SD = 26.8). Small sample sizes are a recurrent limitation of psychological research investigating ejaculate quality (e.g., Baker & Bellis, 1989; Pook et al., 2005). Bootstrapping is a statistical technique that can provide a confidence interval for correlation and regression coefficients. Bootstrapping is appropriate for sample sizes that are smaller than what is necessary for coefficient stabilization (Schönbrodt & Perugini, 2013). In the current study, we report bootstrapping confidence intervals in an effort to strengthen our interpretation of the results. Additionally, a sample size of 45 can detect a correlation of at least 0.405 with 80% power and α of 0.0499.

2.2. Self-report measures

Participants completed a survey that included the following parts:

HEXACO-60 (Ashton & Lee, 2009). This 60-item measure assesses six personality dimensions: honesty-humility (e.g., “I would never accept a bribe, even if it were very large”), emotionality (e.g., “I sometimes can't help worrying about little things”), extraversion (e.g., “The first thing that I always do in a new place is to make friends”), agreeableness (e.g., “I rarely hold a grudge, even against people who have badly wronged me”), conscientiousness (e.g., “I plan ahead and organize things, to avoid scrambling at the last minute”), and openness to experience (e.g., “I'm interested in learning about the history and politics of other countries”). Participants reported their level of agreement with each statement ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). Previous research provides evidence of the reliability and validity of the HEXACO-60 (Ashton & Lee, 2009). Participants completed the HEXACO-60 before providing the first ejaculate. Table 1 reports descriptive statistics and internal consistencies for the six HEXACO dimensions.

Demographics. Participants completed a survey before providing the first ejaculate on which they reported their age and relationship length (in months). Participants also completed a survey after providing each ejaculate that included a query about abstinence duration prior to producing that ejaculate. We also obtained several body measurements (e.g., height, weight, and several measurements not related to the current study; data reported by Pham et al., 2018).

3. Procedures

All procedures were approved by the institutional review board of the university where data were collected. Participants were recruited via advertisements posted on bulletin boards on the campus of a Midwestern university in the United States. Participants contacted the laboratory to schedule three in-person sessions. In the first session, participants were escorted to a private room, and completed a survey containing the self-report questionnaires (see Self-report measures). Then, the researcher collected several body measurements (e.g., height, weight; see Pham et al., 2018, for details). Immediately after the first session, participants received materials required to collect and transport two masturbatory ejaculates in two scheduled sessions (i.e., the second and third sessions). The materials included non-latex, non-spermicidal condoms, plastic twist-ties, screw-top specimen containers, biohazard Ziploc bags, and aluminum foil.

Participants were instructed to abstain from ejaculating for at least 48 h prior to each masturbatory session. They were asked to masturbate without the help of their partner and to not use any materials that we did not provide (e.g., pornography, lubricant). Participants masturbated to ejaculation in a private location of their choosing while wearing the provided condom. After ejaculation, participants sealed the condom and delivered it (within one hour of ejaculation) to the laboratory. Participants received US$25 at the conclusion of each session. As part of an experiment unrelated to the current study, participants received two randomly assigned written experimental scenarios and were instructed to masturbate while thinking about one scenario in each of the two masturbatory sessions (see Pham et al., 2018). None of the ejaculate parameters differed significantly between the two scenarios (see below; parameters included sperm morphology, functional sperm concentration, sperm swimming velocity, and motile sperm concentration).

Table 1
Descriptives for parameters included in the single-component ejaculate quality assessment, personality dimensions, and covariates (n = 45).

	M	*SD*	Skewness	Kurtosis	SW test	
Ejaculate parameters						
Sperm morphology (% normal)	29.6	9.9	0.88	0.35	0.91*	
Functional sperm concentration (M/ml)	10.3	10.6	1.46	1.97	0.84***	
Sperm concentration (M/ml)	55.7	34.3	0.29	−0.79	0.93*	
Functional sperm number (M)	23.0	24.9	1.47	1.40	0.81***	
Sperm velocity (μ/s)	8.8	3.1	0.20	−0.60	0.97	
Sperm motility index	85.9	77.0	1.07	0.04	0.85**	
Motile sperm concentration (M/ml)	23.3	18.0	0.98	0.85	0.93**	
Personality dimensions						**Cronbach's α**
Honesty-Humility	4.1	0.7	0.12	−0.85	0.97	0.78
Emotionality	4.1	0.6	−0.09	−0.70	0.97	0.75
Extroversion	3.3	0.8	0.70	0.50	0.95	0.88
Agreeableness	3.6	0.7	0.05	−1.10	0.94	0.74
Conscientiousness	3.5	0.6	0.77	0.56	0.94	0.76
Openness to Experience	3.5	0.7	0.26	−0.78	0.95	0.84
Covariates						
Age	23.3	3.6	0.90	0.23	0.92**	
Body Mass Index (BMI)	27.2	5.1	1.32	3.64	0.92**	
Abstinence duration	3.2	5.1	5.72	35.23	0.34***	

Note: SW test = Shapiro Wilk's test. See text for descriptions of variables.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

4. Statistical analysis

All statistical analyses were conducted via SPSS version 25. We first investigated the distribution of each ejaculate parameter and personality dimension. For each variable, we conducted a Shapiro–Wilk's test and generated histograms to assess skewness and kurtosis. The results indicated a non-normal distribution for several variables. We then estimated Spearman's *rho* coefficients to accommodate non-normality. We correlated each parameter across the two ejaculates provided by each participant. Each parameter was moderately correlated across the two ejaculates (average Spearman's *rho* = 0.44; $p < 0.05$). These results indicated that the manipulation involving the written scenarios did not affect the ejaculate parameters assessed in this study, corroborating the results reported by Pham et al. (2018). For parsimony and reportorial efficiency, we averaged parameters estimated from the two ejaculates for each participant. We verified that ejaculate parameters were within the reference values for fertile ejaculate characteristics provided by the World Health Organization (WHO, 2010, see Table 1).

The SQA-V assesses 17 ejaculate parameters (see Pham et al., 2018). Once ejaculate parameters were averaged across the two ejaculates (see above), we performed a principal components analysis to reduce the number of parameters and thereby decrease Type I error associated with multiple statistical tests. Parameters were removed one at a time until a single-component structure was identified in which all factor loadings were above 0.70. This final structure included seven ejaculate parameters (see Pham et al., 2018, and Table 1): *sperm morphology* (percentage of morphologically normal sperm, in%), *functional sperm concentration* (number of motile sperm [based on grades "a" and "b"; see Cooper et al., 2010] that are morphologically normal per unit ejaculate, in millions/milliliter [M/ml]), *sperm concentration* (number of sperm per unit ejaculate, in M/ml), *functional sperm number* (number of motile sperm that are morphologically normal, in M), *sperm velocity* (swimming speed of the fastest moving sperm, in microns per second [μ/s]), *sperm motility index* (an index of overall quality based on sperm motility, progressive motility, and velocity; this measure is proprietary to the SQA line of semen analyzers), and *motile sperm concentration* (number of motile sperm per unit of ejaculate, based on grades "a" and "b" (Cooper et al., 2010). M/ml). Standardized factor scores for this single-component solution were retained as the measure of ejaculate quality for the remainder of analyses.

Next, we correlated the single-component "ejaculate quality" score with scores on the six HEXACO personality dimensions. Some ejaculate parameters may vary over the lifespan—for example, the average number of sperm in an ejaculate decreases with age (Ng et al., 2004). Additionally, obesity is associated with infertility in men. For instance, Body Mass Index (BMI) is negatively associated with sperm count (Eisenberg et al., 2013). Moreover, some ejaculate parameters are affected by abstinence duration prior to ejaculation; for example, rapid and repeated ejaculation reduces sperm number in subsequent ejaculates (Hopkins, Sepil, & Wigby, 2017). We therefore estimated residual (partial) correlation coefficients after statistically controlling for participant BMI, age, and abstinence duration. We generated bootstrapped confidence intervals for these coefficients (n = 1000; 95% CI).

Lastly, we used linear multiple regression analysis to predict ejaculate quality from the HEXACO personality dimensions. We constructed two models: the first included the six personality dimensions as predictors of ejaculate quality. The second was a hierarchical model in which the first step included BMI, age, and abstinence duration, and the second step included the six personality dimensions. We also produced bootstrapped confidence intervals (n = 1000; 95%) for the results of these multiple regression analyses.

5. Results

We identified significant correlations between ejaculate quality and the HEXACO personality dimensions after controlling statistically for BMI, age, and abstinence duration. Specifically, agreeableness and openness to experience were significantly associated with ejaculate quality, and in each case the correlation was negative (see Table 2). To identify whether any of the six personality dimensions uniquely predicted ejaculate quality, we next conducted multiple regression analysis.

The multiple regression analysis in which the six personality dimensions were included to predict ejaculate quality revealed that the only significant predictor of ejaculate quality was agreeableness. Agreeableness negatively predicted ejaculate quality, corroborating the partial correlation analyses (although the bootstrapped confidence interval included zero; see Table 3). However, once the covariates of BMI, age, and abstinence duration were included in a hierarchical regression (along with the six personality dimensions), agreeableness was no longer a statistically significant predictor of ejaculate quality, although the direction of the relationship remained negative. Instead, the only statistically significant predictor of ejaculate quality was abstinence duration, which positively predicted ejaculate quality (see Table 4).

Table 2
. Bootstrapped Spearman's *rho* correlation matrix of ejaculate quality and personality dimensions after controlling for participant age, BMI, and abstinence duration (n = 45).

	H	E	X	A	C	O
Ejaculate Quality	−0.15 [−0.56, 0.34] 0.473	−0.03 [−0.38, 0.31] 0.875	−0.37 [−0.66, 0.11] 0.062	**−0.46 [−0.75, −0.05] 0.019**	−0.03 [−0.44, 0.41] 0.894	**−0.42 [−0.71, −0.03] 0.033**

Note: For each dimension: First line is Spearman's *rho* after controlling for participants' age, BMI, and abstinence duration. Second line is bootstrapped confidence interval (n = 1000; 95%). Third line is two-tailed p-value. Bold indicates $p < 0.05$. H = Honesty-Humility; E = Emotionality; X = Extroversion; A = Agreeableness; C = Conscientiousness; O = Openness to Experience.

Table 3
Multiple regression analysis predicting ejaculate quality from the HEXACO personality dimensions.

Personality dimensions	b	β	*t*	*p*
Honesty-Humility	0.40	0.29	1.37	.184
Emotionality	0.17	0.10	0.52	.605
Extraversion	−0.28	−0.21	−1.03	.315
Agreeableness	**−0.84**	**−0.54**	**−2.36**	**.027**
Conscientiousness	0.13	0.08	0.41	.689
Openness to experience	−0.04	−0.03	−0.13	.897

Note: Bold indicates $p < 0.05$.

Table 4
Hierarchical multiple regression with covariates (age, BMI, and abstinence period) and HEXACO personality dimensions predicting ejaculate quality.

Step 1	b	β	T	p	C.I.
Abstinence Period	**0.10**	**0.60**	**3.89**	**.001**	[−0.05, 0.41]
BMI	−0.03	−0.11	−0.69	.498	[−0.11, 0.04]
Age	−0.05	−0.17	−1.09	.286	[−0.14, 0.06]
Step 2					
Abstinence Period	**0.07**	**0.41**	**2.21**	**.039**	[−0.10, 0.43]
BMI	−0.05	−0.20	−1.16	.259	[−0.16, 0.05]
Age	−0.04	−0.14	−0.77	.449	[−0.18, 0.14]
Honesty-Humility	0.11	0.08	0.39	.704	[−0.67, 0.93]
Emotionality	0.11	0.07	0.37	.715	[−0.66, 0.73]
Extraversion	−0.08	−0.06	−0.31	.761	[−0.80, 0.60]
Agreeableness	−0.62	−0.40	−1.79	.089	[−1.46, 0.38]
Conscientiousness	0.02	0.01	0.08	.940	[−0.82, 0.94]
Openness to Experience	−0.05	−0.03	−0.17	.868	[−0.65, 0.67]

Note: bold-faced type indicates $p < 0.05$. C.I. refers to bootstrapped confidence intervals (n = 1000; 95%).

6. Discussion

We investigated associations between six major personality dimensions and ejaculate quality. Our findings are partially in line with previous research, but they also differ in several ways. For example, Conrad et al. (2002) documented that "sperm parameters" (a latent variable that included sperm count, motility, morphology, and vitality) was negatively associated with extraversion, but the negative association of extraversion with ejaculate quality in the current research was not statistically significant. The negative association between extraversion and ejaculate quality observed in previous studies of infertile samples may not generalize to normal fertility samples such as the samples secured in the current research. Alternatively, the association between extraversion and ejaculate quality may have failed to reach statistical significance because our relatively small sample produced insufficient power to detect a small effect. Future studies could employ larger samples of non-vasectomized men with no history of infertility, estimate effect sizes across multiple studies (e.g., meta-analysis), and investigate the role of fertility on the associations between ejaculate quality and individual differences.

Pook et al. (2005) documented negative associations between sperm concentration and conscientiousness. We did not replicate this result. The relationship between conscientiousness and ejaculate quality may be affected by several covariates (e.g., participant age), however, which Pook et al. did not assess. Older men (relative to younger men) produce fewer sperm per ejaculate (Ng et al., 2004) and score higher in conscientiousness (Roberts, Smith, Jackson, & Edmonds, 2009). The negative associations reported by Pook et al. therefore may be due to the inclusion of relatively older men in their sample (M_{age} = 31.0; SD_{age} = 7.7). Future studies could consider the role that factors such as coping styles (e.g., Pook et al., 2005) may play in the potential association between conscientiousness and ejaculate quality. Certainly, active forms of coping—which tend to characterize individuals with high levels of conscientiousness—are likely to produce adrenergic activations that may inhibit processes linked with spermatogenesis (Pook et al., 2005).

Our results indicate a zero-order negative correlation between openness to experience and ejaculate quality. No previous research has reported associations between this personality dimension and ejaculate quality. We are not prepared to speculate about the relationship between openness to experience and a *single* analysis indicating a relationship with ejaculate quality. In contrast, a *pattern* of relationships indicates that agreeableness is negatively associated with ejaculate quality. One speculative explanation for this result is that disagreeable men may experience better mental health (i.e., assertiveness [a positive correlate of disagreeableness] is associated with better mental health; Pourjali & Zarnaghash, 2010) and, therefore, such men may experience less adrenergic activation. We note, however, that the statistically significant relationship identified between agreeableness and ejaculate quality no longer reached conventional levels of statistical significance once we control for participant age, BMI, and abstinence duration, suggesting that these covariates—in particular, abstinence duration (see Table 4)—explain the majority of variance in ejaculate quality, in line with previous research (Cooper et al., 2010)

The current study has several limitations. First, the sample size may not have been sufficient to detect small effects; some correlations of moderate effect size were not statistically significant (e.g., between extraversion and ejaculate quality). Small sample sizes are a recurrent limitation of psychological research investigating ejaculate quality (e.g., Baker & Bellis, 1989; Pook et al., 2005), in part due to difficulties recruiting participants outside a clinical setting. For example, Pook et al. (2005) reported results without confidence intervals and using a sample of only 54 men. The reports using the largest sample sizes, Conrad et al. (2002) and Hellhammer et al. (1985), assessed samples of 94 and 117 men, respectively, which are still smaller than the sample size necessary for correlation stabilization (Schönbrodt & Perugini, 2013), and neither study reported bootstrapped confidence intervals. In the current study, we reported our results alongside bootstrapped confidence intervals. Bootstrapped confidence intervals are larger when conducted with small sample sizes, and therefore may overlap with correlations conducted with larger sample sizes (Schönbrodt & Perugini, 2013), thus providing valuable information regarding correlation coefficients that could be derived from larger sample sizes. Our results revealed correlations with relatively large effect sizes (Spearman's *rho* > 0.40), which remained moderate even at the lower bound of a bootstrapped confidence interval and after controlling for several covariates. Future research may use different methods of data collection to secure larger samples (e.g., surveying consenting patients whose ejaculate parameters are already archived in fertility clinic databases). Lastly, we did not assess basal levels of hormones related to spermatogenesis (e.g., testosterone) which may account, in part, for relationships between ejaculate quality and personality dimensions. Men with lower circulating levels of testosterone tend to produce lower quality ejaculates, because insufficient testosterone

impairs spermatogenesis (Meeker, Godfrey-Bailey, & Hauser, 2007). One speculation, therefore, is that low testosterone in men could be associated with both high agreeableness and lower-quality ejaculates.

Despite these limitations, the current research provides several contributions to the literature addressing the relationships between personality dimensions and ejaculate quality. Whereas previous research relied on data secured from a single ejaculate (Conrad et al., 2002), we secured and assessed two ejaculates per participant, and averaged the two parameter estimates after verifying that they did not differ significantly. Previous research did not control for potential effects attributable to pathologies that may impair spermatogenesis and related processes (Hellhammer et al., 1985). We verified that ejaculate parameters were within WHO reference values for fertile ejaculates, producing results that might be generalizable to fertile populations.

7. Conclusion

In conclusion, we investigated the relationships between major personality dimensions and ejaculate quality in a design that offered several methodological improvements over previous research. We provided preliminary evidence that agreeableness may be negatively associated with ejaculate quality, although we caution that this relationship warrants replication by future research. The current study adds to a body of evidence indicating that psychological attributes—including major dimensions of personality—may be associated with ejaculate quality.

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