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Digit Ratio as a Predictor of Risk Taking and Sensation Seeking Personality Traits and Behaviors

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Abstract

Digit ratio is the difference in length between the pointer finger and the ring finger on either hand. Commonly referred to as the 2D:4D ratio, this ratio is determined prior to birth, and serves as an indicator of prenatal hormone exposure. Digit ratio has been found to correlate with fundamental personality and behavior characteristics in adulthood. Digit ratio is also thought to be a determinate of sexual orientation in both men and women, but has been debated in the literature. This study examined multiple 2D:4D relationships. Men who were found to have a more masculinized (ie. lower) digit ratio had significantly higher rates of overall sensation seeking, boredom susceptibility, disinhibition, experience seeking, and lifetime drug behaviors. We found no significant relationships between 2D:4D ratio and behaviors in females. Similarly, we found no relationship between digit ratio and sensation seeking, impulsive, or risky personality traits either. Digit ratio bad no relationship with sexual orientation, nor on number of older brothers. Overall, our findings suggest that there is a significant relationship between a masculinized digit ratio and certain sensation seeking and risk taking behaviors in men.

For Meredith,

For all the long nights turned early mornings of research and writing, and staying relentlessly by my side through it all.

All of my love to you.

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Digit Ratio as a Predictor of Risk Taking and Sensation Seeking Personality Traits and Behaviors

Before birth, prenatal forces are at work that set the stage for growth and development later in life. What if something as readily measurable as finger length at birth could predict future behaviors and personality traits? An individual's 2D:4D digit ratio (the ratio between the length of the pointer and ring finger) is determined before birth by prenatal sex hormone levels, and may be a key indicator of personality and behavioral characteristics later in life. This study aims to review the literature on digit ratio and to determine if prenatal sex hormone exposure, as indicated by digit ratio in adulthood, is an accurate predictor of sensation seeking, risk-taking, and impulsive behaviors and other personality traits.

Digit Ratio

The 2D:4D digit ratio has been linked to a variation in prenatal hormone levels in utero that may have implications on various adult behaviors and personality factors. *Hox* genes control specific aspects of fetal vertebrae development, namely the development of appendages and gonads (Manning, Scutt, Wilson, & Lewis-Jones, 1998). Specifically, the *Hoxa* and *Hoxd* genes are responsible for the organization of digits, among other important developmental processes. This finding has led researchers to manipulate genetic codes through deletion and gene inactivation, as well as expose animal fetuses to differing hormone levels of androgen and estrogen, to determine the interaction of *Hox* genes and hormone exposure on digit formation and length (Kondo, Zákány, Innis, & Duboule, 1997; Zheng & Cohn, 2011). As digit ratio is likely determined in utero, the difference in the second and fourth digits can be detected as early as two years old

(Manning et al., 1998). The ratio does not appear to change, which is notable due to the second round of major hormone exposure caused by puberty, suggesting that digit ratio is a fixed measurement established during prenatal development (Lippa, 2003).

Digit ratios of men and women tend to vary, in that men are likely to have a longer fourth digit than second digit, and women are likely to have a longer second digit than fourth digit (Manning et al., 1998). Thus, the ratio of the second to fourth digit is typically lower in males than in females. There is a clear development of the second and fourth digits around the central axis of the third digit; however, in Manning's time it was relatively unknown why these two digits have sexually dimorphic variations.

Manipulating hormones produced by developing sex organs may in turn influence the development of digits in utero (Fink, Neave, Laughton, & Manning, 2006). Zheng and Cohn examined the sexually dimorphic effects of androgen and estrogen receptor activity on gene regulation during the critical period for digit development in mice (2011). Androgen and estrogen receptors influence the ratio between the second and fourth digit, in which both receptors have higher activity in the fourth digit than the second. This leads to greater variation in the length of the fourth digit, while the length of the second digit remains less variable during development. As males are exposed to higher levels of circulating androgen and lower estrogen, it causes androgen receptor activation, leading to an increased growth of the fourth digit, and thus a lower digit ratio. Conversely, females are exposed to higher prenatal estrogen levels than androgen levels, causing a decreased growth of the fourth digit in relation to the second, and a higher digit ratio (Zheng & Cohn, 2011). The manipulation of hormone levels ultimately affects digit

development, suggesting that measuring digit ratio is an accurate determinate of prenatal hormone exposure.

The 2D:4D ratio is not the only sexually dimorphic trait that sex hormones influence. There are multiple differences in brain structure that exist between males and females. Exposure to varying levels of hormones derived from testosterone influence the development of multiple brain regions (Hines, 2010). These hormone fluctuations may cause differences in the size of specific brain structures that tend to be associated with more masculine or feminine traits and behaviors. Differences exist in the hippocampus, amygdala, and overall brain hemispheres that are likely caused by the presence of receptors in such structures during neural development (Cahill, 2006). These findings have implications for behavior, disease diagnosis, and treatment course. For example, neural disorders like schizophrenia exhibit morphological differences in brain structure sizes between men and women, such that men show enlarged ventricles, while women portray no ventricle changes (Cahill, 2006). It may be that examining neural differences in traditionally masculinize or feminized brain structures, caused by fluctuations in hormone levels present during development, could help determine the meaning of various sex-linked behaviors, and possibly assist in disorder diagnosis.

Digit ratio has been a strong predictor of sexual orientation in men and women. According to some neurohormonal theories of human sexual orientation, exposure to higher levels of androgens in utero may lead to heterosexual orientations in men and homosexual orientations in women, while exposure to lower androgen levels may lead to the opposite in the two sexes (Lippa, 2003). According to Lippa, homosexual men had a higher 2D:4D ratio in both their right and left hands compared to heterosexual men, but

there was no significant difference between lesbian and heterosexual women (2003). Various other studies have determined that there is a relationship between digit ratio and sexual orientation, but there is conflicting evidence as to what positive or negative direction the variance in digit ratio – and thus prenatal hormone levels – may be a determinant of sexual orientation (Blanchard, 2001). For example, studies like Lippa's (2003) have found homosexual men to have higher digit ratios, while others (Robinson & Manning, 2000) have reported them to have lower ratios. Because not all studies have ethnically homogenous samples, there may be some inconsistency in the effect ethnicity plays in this equation (McFadden et al., 2005). Past studies have suggested illegitimate conclusions if heterosexual and homosexual samples are not ethnically consistent (Lippa, 2003). After reanalyzing the data of five past studies while controlling for age and ethnicity, results showed that age, ethnicity, and errors in measurement did not account for the variability within the digit ratio of heterosexual versus homosexual men. Other hypotheses have been considered to interpret the variations found in digit ratio between heterosexual and homosexual men and women. Possible explanations for the 2D:4D ratio discrepancies include variations in androgen exposure caused by congenital adrenal hyperplasia, or the fraternal birth order effect, which is a predictor of sexual orientation in men (Blanchard, 2001; McFadden et al., 2005).

The fraternal birth order effect, occurring only in men, is the effect of the number of older brothers an individual has on the likelihood of identifying with a homosexual orientation. With each biological older brother from the same mother, the incidence of a homosexual orientation increases in biological males. This may happen due to antigens that create an immune reaction when a mother carries a male fetus, and grows in strength

when a female carries subsequent male fetuses. The mother creates an immune response that in turn affects fetal male brain development, and may "prevent the brain from developing in the male-typical pattern" (Kangassalo, Pölkki, & Rantala, 2011), p. 499). The Blanchard study examined the relationship between sexual orientation, digit ratio, and number of older brothers in adult males in order to test this hypothesis. The three factors were found to correlate with each other, suggesting that the phenomenon of the fraternal birth order effect is a possible factor in the outcome of sexual orientation.

The interaction between gene deletion and inactivation, and the manipulation of androgen and estrogen hormones and receptors has helped determined the process of digit formation developed in utero. Digit ratio, coined by Manning (1998), appears to be a sexually dimorphic characteristic, just as certain brain structures portray sexual dimorphism. Differences in digit ratio not only vary among males and females, but also appear to vary among homosexual and heterosexual men as well. Interestingly, the fraternal birth order may influence the likelihood of the younger males to identify as gay. Thus, biological variables, including digit ratio, have multiple implications for human behavior and personality.

Digit Ratio, Personality, and Behavior

In addition to mice and fish, prenatal androgen levels directly affect the digit ratios of nonhuman primates as well. Digit ratio is likely to predict dominant and aggressive behaviors in female chacma and Hamadryas baboons (Howlett, Marshall, & Hughes, 2012). Female baboons with a low digit ratio, more closely approximating that of males, were more dominant in their troops and held higher social rank than female baboons with higher digit ratios.

Just as increased dominance and aggressive behaviors have been correlated with lower digit ratios in nonhuman primates, these behaviors have been explored in humans as well. Women who identify as feminists tend to have more masculinized traits, including competitiveness and social dominance (Madison, Aasa, Wallert, & Woodley, 2014). In this study, Madison et al. used the Ray Directiveness scale to measure social dominance, which is predictive of both masculine and feminine orientations in men and women. When comparing self-identified feminists to women in general, there were significant differences in the 2D:4D digit ratios of feminist activists, which were more masculinized than those of comparison groups. Additionally, there were higher levels of directiveness reported by feminists than those of the comparison groups (Madison et al., 2014). These findings demonstrate the correlational value of the 2D:4D ratio to certain masculine characteristics in some feminist women.

Digit ratio has been correlated with the "big five" personality traits, in which the NEO Five-Factor Inventory has been used to test for sex differences in different personality factors (Fink, Manning, & Neave, 2004). In this study, significant results were found only for females, in which there was a positive correlation between digit ratio of the right hand and neuroticism (anxiety, anger, jealousy, loneliness, and low moods), and a negative correlation with agreeableness (warmth, optimism, and friendliness). Although there were no significant findings in the male sample of this study, Fink et al. determined that higher digit ratios in women correlated with higher neuroticism and lower agreeableness (2004). These findings were only significant on the right hand, suggesting that during development the right hand ratio may have a greater sensitivity to prenatal hormone exposure than the left (Fink et al., 2004).

Using the same Five-Factor Inventory, men tend to report higher scores on openness (curiosity, adventure, enjoyment from varied experiences) and extraversion (outgoing, energetic, sociable), while women report higher scores on contentiousness (disciplined, organized, dependable) and neuroticism (Fink et al., 2006). Further investigation has been done on the relationship between digit ratio and specific personality factors, particularly sensation seeking. Although no associations were found for women using the Sensation Seeking Scale Form V, Fink et al. determined that men with a low digit ratio scored higher on overall sensation seeking, and on the specific factor of boredom susceptibility (2006). This suggests there is a positive correlation between sensation seeking and prenatal testosterone levels in males. Men exposed to high levels of androgen in utero may be predisposed to greater sensation seeking tendencies later in life.

In contrast to the sex differences present in sensation seeking behaviors, it is unclear if sex differences exist in risk-taking behaviors. One study found that men scored lower on an overall risk-taking scale, and thus engage in more risky behaviors than women (Kim & Kim, 2014). However, sex differences were not clear when analyzing specific risk-taking domains including financial, health-safety, recreational, ethical, and social. Additionally, although the relationship was not significant between the risk-taking and the personality survey closely related to the big five, Kim & Kim ultimately determined that sex differences, measured by digit ratio, should not be ignored in this relationship (2014).

It may be that more focused examination of certain personality traits leads to an increase in the accuracy of associations between digit ratio and personality. For example,

Wacker et al. explored Wilson and Daly's "young male syndrome," composed of "assertiveness/social dominance, aggression, and impulsive sensation seeking" (2013, p. 172). They suggest that the use of more specific assessment of these three traits, and other personality traits in general, may lead to more consistent correlations with digit ratio. To achieve this, it is suggested that "removing the variance associated with other trait factors" can isolate specific facets of the trait one is interested in studying. In this case, looking at specific contributions of the three components of the "young male syndrome" can better determine what associations exist between the personality traits and the 2D:4D ratio (Wacker, Mueller, & Stemmler, 2013).

Through the use of a multitude of personality scales, which aimed to encompass various theoretical approaches and specific personality facets, Wacker et al. (2013) determined that impulsive sensation seeking was the only aspect of the "young male syndrome" that significantly correlated with a male-typical 2D:4D digit ratio. Both assertiveness/social dominance and aggression did not yield any significant associations with digit ratio, which may suggest that past findings of correlations between digit ratio and the "young male syndrome" may be entirely due to the significant associations with impulsive sensation seeking. This finding may demonstrate the importance of partialling, in which more specific and unique personality traits are significantly correlated with digit ratio on their own, rather than when lumped with more general traits. This allows for isolated focus on the specific contributions of a single trait, like impulsive sensation seeking (Wacker et al., 2013).

Hypotheses. The current study aims to focus on multiple hypotheses. Firstly, it is hypothesized that men will have a lower digit ratio than women on both hands,

presumably due to higher prenatal androgen exposure (Manning et al., 1998; Zheng & Cohn, 2011). Second, because males with a greater number of older brothers have a greater likelihood of exhibiting a homosexual orientation and homosexual men often possess a higher digit ratio, we predicted that the number of older brothers and sexual orientation would have significant main effects on digit ratio (Blanchard, 2001; Lippa, 2003; McFadden et al., 2005). One study by Kangassalo, Pölkki, & Rantala (2011) also suggested that there may be an interaction between these factors, such that sexual orientation would be more strongly related to digit ratio when there are older brothers present. Thirdly, we hypothesize a more masculine digit ratio, after controlling for sex, will positively correlate with some personality traits, particularly extraversion and openness from the big five personality traits, as well as sensation-seeking and impulsivity of the 27-factor traits (Fink et al., 2006; Wacker et al., 2013). Finally, we predict that digit ratio, after controlling for sex, is associated with sensation seeking and risky, impulsive behaviors (Fink et al., 2006; Lin, 2009; Sadeh & Baskin-Sommers, 2016; Zuckerman, 2007).

Method

Participants

Thirty-six biological male and 90 biological female students participated in this study. Thirty males identified as heterosexual, while only 6 identified as non-heterosexual. 74 females identified as heterosexual, and 16 identified as non-heterosexual. Students were recruited from undergraduate psychology courses, including Introductory Psychology and upper division psychology courses at Eastern Illinois University. Recruitment also took place through EIU Pride (n = 15), a student

organization that traditionally has higher percentages of individuals with non-heterosexual orientations. Introductory Psychology students signed up through SONA, and were granted one hour of research participation credit for their time as incentive. Upper level psychology students signed up via email, and many were provided with extra credit as incentive to participate. All participants filled out a form with their name and email address if they wished to be entered to win an additional incentive of a $15 Amazon gift card at the conclusion of the study. Through award funding by the Eastern Illinois University College of Sciences Graduate Student Investigator award and the EIU Graduate Student Advisory Council scholarship, a total of 40 gift cards were awarded to participants. Participant information was in no way connected to survey answers or digit measurements, ensured by a randomized ID number.

Materials

Demographic Information. The demographic information requested included participant age, biological sex assigned at birth, whether or not they identify with their biological sex, year in school, sexual orientation delineated by heterosexual or non-heterosexual orientations, and number of biological older brothers from the same mother.

Questionnaires. The *Sensation Seeking Scale Form V* (Zuckerman, Eysenck, & Eysenck, 1978) test battery contains 40 two-alternative forced choice questions broken into four subscales of 10 items each, measuring thrill and adventure seeking (*TAS*), experience seeking (*ES*), disinhibition (*DIS*), and boredom susceptibility (*BS*). The sum of the subscales provides a total score from 0 to 40, with subscale scores ranging from 0 to 10. *TAS* measures the drive to participate in activities considered dangerous that could potentially cause harm. An example of a test item in this subscale is, "11: A. A sensible

person avoids activities that are dangerous" or "B. I sometimes like to do things that are a little frightening." *ES* measures desire to find new experiences in a rebellious nature. An example from this subscale includes, "9: A. I have tried marijuana or would like to" or "B. I would never smoke marijuana." *DIS* assesses curiosity to engage in activities characterized by a lack of restraint in various situations. An example item from *DIS* is, "1. A. I like 'wild' uninhibited parties" or "B. I prefer quiet parties with good conversation." *BS* measures agitation and disinterest with following a routine and experiencing repetition. A sample item of this final subscale includes, "31: A. The worst social sin is to be rude" or "B. The worst social sin is to be a bore" (Fink et al., 2006; Zuckerman et al., 1978). When scoring this inventory, one point is given to each response designated as "high" sensation seeking behaviors. The higher the score, the more likely an individual will seek out opportunities that provide them sensations. The alpha reliability level of the total scale is .76. The alpha levels of the individual subscales are: *TAS* = .75, *ES/DIS* = .69, and *BS* = .62.

The *Risky Impulsive Self-destructive behavior Questionnaire* (Sadeh & Baskin-Sommers, 2016) or *RISQ* is a 38-question survey consisting of multilevel questions on risky behavior occurrences throughout the lifetime (A) and in the past month (B), age of behavior onset (C), consequences of behaviors (D), and affective triggers (E/F). The *RISQ* includes eight factors measuring illegal behaviors, aggression, self-harm, gambling, risky sexual behaviors, heavy alcohol use, impulsive eating, and reckless behavior. When scoring the RISQ, the number of occurrences, age of onset, consequences, and triggers are summed and averaged. Examples of sample items include "Used heroin," "Gotten in a physical fight," "Paid for sex," and "Ran red lights or ignored stop signs." The internal

consistency among the eight scales is reported as excellent at Cronbach's alpha = .92. The RISQ total score is associated with borderline and antisocial personality disorder, due to the behavioral risk taking and self-destructive nature of these disorders (Sadeh & Baskin-Sommers, 2016).

The final inventory being used is the *Synthetic Aperture Personality Assessment (SAPA) Personality Inventory* (Condon, 2017). There are multiple different variations of the *SPI* available for use, but for this study the SPI-81-27&5 will be used. The inventory contains 81 items answered on a six-point Likert scale from 1 "very inaccurate" to 6 "very accurate." It measures two different scales, a 5-factor scale based on the big five personality traits and an expanded 27-factor personality trait scale. Examples of test items include, "Dislike myself," "Trust people to mainly tell the truth," and "Am an original thinker." Although shorter versions of this inventory are available they are not recommended due to low validity. Additionally, Wacker et al. (2013) suggested the importance of breaking down broad personality traits into more detailed characteristics to develop a more accurate inventory of an individual's personality. For the purpose of this study, the results of the 5-factor and 27-factor scale will be analyzed from the dataset. Of the 81 test items, there are three items associated with one of the 27-factor traits. Additionally, 42 of the 81 items are associated with one of the 5-factor traits. To score the SPI, numeric responses to specified items in each trait category are added together to create a scaled score of a given trait, with higher scores indicating greater expression of a particular trait. Some items are reverse scaled, in which the value of seven is subtracted from the response value. The internal consistency of the SPI-81 for the 5-factor scale ranges from Cronbach's alpha = .72 to .86. The unidimensionality for this scale ranges

from .58 to .78. For the 27-factor scale, Cronbach's alpha = .62 to .89. The unidimensionality for the scale ranges from .67 to .96.

Digit Ratio Measurement. Digit ratio measurement was used in this study as an indicator of prenatal androgen exposure. There is a discrepancy in past 2D:4D studies in the method of measuring digits. Some have taken photocopies of participants hands and measured the digits following an individual's completion of the experiment, while others recorded live measurements from the participants hands before they leave (John T. Manning, Fink, Neave, & Caswell, 2005). The current study used live measurements, in which the researcher recorded a single measurement of the participant's second and fourth digit using digital calipers. After placing the hand of a flat surface, digit ratio was measured by identifying the bottom-most crease at the base of the digit on the ventral side of the hand, to the tip of the finger using the digit calipers (01407A Electronic Digital Caliper with Extra Large LCD Screen, Neiko). Measurements were recorded of the second and fourth digit in 0.01 mm measures from both the right and left hand.

Procedure

Students came to a computer lab to complete the questionnaires and provide demographic information through an online survey in Qualtrics. The questionnaires took approximately 35 minutes to complete. After completing the questionnaires, participants placed one hand at a time on a flat surface with the ventral (palm) side facing up, and spread their fingers. Researchers measured the second and fourth digits on the participant's right and left hand with digital calipers, and recorded the measurements to the nearest hundredth of a millimeter for accuracy.

Results

All statistical analyses had an alpha level of .05, unless otherwise noted. Continuous variables used as predictors were centered prior to being entered in statistical analyses. Means and standard deviations of all dependent variables for males and females are in Table 1 and 2.

The first relationship analyzed was the association between the right and left digit ratios. Results indicated that there was a significant positive association between left digit ratio and right digit ratio, $r(124) = .72, p < .001$.

We next examined if men had a lower digit ratio than women on both hands. An independent samples t test confirmed a significant difference in digit ratios of the left hand between males and females, $t(124) = -2.40, p = .02$, *Cohen's d* = .50 Likewise, there was also a significant difference between males and females in digit ratio of the right hand, $t(124) = -2.23, p = .03$, *Cohen's d* = .25. Refer to Table 1 for male and female means and standard deviations.

We predicted that heterosexual men would have a lower digit ratio than the homosexual men, but that this difference would depend on the number of biological older brothers. A general linear model (GLM) univariate procedure was conducted for both males and females to determine if sexual orientation predicted digit ratio and was contingent upon number of older brothers. Results show there were no significant main effects for sexual orientation or number of older brothers, nor a significant interaction between sexual orientation and number of older brothers for left or right digit ratio.

Questionnaire Results

After controlling for sex differences, we predicted that more masculinized (i.e., lower) digit ratios would predict higher scores on certain traits from the SAPA Personality Inventory. A GLM univariate procedure was conducted for each of the 5-factor and 27-factor personality traits to determine a significant difference between any of the traits, biological sex, or digit ratio on the right and left hand. At an alpha level of .01 for the 5-factor traits and an alpha level of .002 for the 27-factor traits, significant results emerged only for the emotional stability personality trait.

To assess the effect of biological sex and digit ratio on emotional stability, two separate general linear models were run that incorporated the digit ratio of either hand, see Table 3 and 4. Results showed there were significant main effects of biological sex on emotional stability in both analyses. Follow up analyses showed a significant difference in which males have greater emotional stability than females, $t(124) = 4.89$, $p < .001$, *Cohen's d* = .99, see Table 2 for means and standard deviations. No other statistically significant main effects or interactions were found for digit ratio or biological sex on the other personality traits.

In the fourth and final analysis, we predicted that digit ratio, after controlling for biological sex, would be associated with sensation seeking, risky, impulsive, and self-destructive behaviors, delineated by the Sensation Seeking Scale Form V and the Risky Impulsive Self-Destructive behavior Questionnaire. A GLM univariate procedure was conducted for each of the behavior subscales from both questionnaires to determine if digit ratio predicted these behaviors.

Sensation Seeking Scale. Results for overall sensation seeking behavior show there was a significant interaction between biological sex and left digit ratio on the total

score, see Table 5, as well as a significant interaction between biological sex and right digit ratio on the total score, see Table 6. Follow up analyses indicated that there was a significant negative correlation in males between the total score and digit ratio of the left hand, $r(34) = -.37, p = .03$, and digit ratio of the right hand, $r(34) = -.42, p = .01$. This suggests that a more masculinized (i.e., lower) digit ratio is associated with higher scores of overall sensation seeking behaviors. No significant correlations were found in females, $r(88) = .05, p = .64$, and $r(88) = .07, p = .53$, left and right digit ratio respectively.

There was a significant main effect of right digit ratio on boredom susceptibility, and a significant interaction between biological sex and right digit ratio, see Table 7. Follow up results indicated that there was a significant negative correlation between digit ratio of the right hand and boredom susceptibility in males, $r(34) = -.36, p = .03$, suggesting that a more masculinized digit ratio is associated with higher scores of boredom susceptibility. There were no significant associations in females, $r(88) = -.03, p = .78$. The results of left digit ratio and biological sex on boredom susceptibility were similar, although not quite at the same level of significance, see Table 8.

Results of the disinhibition subscale indicate that there was a significant interaction between biological sex and digit ratio of the left hand, see Table 9. Follow up analysis indicated a significant negative correlation between left digit ratio and disinhibition in males, $r(34) = -.37, p = .03$. This again suggests that a lower, and thus more masculinized, digit ratio is associated with higher scores of disinhibition. Females were found to have no significant correlations between digit ratio and disinhibition, $r(88) = .02, p = .84$).

Finally, results of the experience seeking subscale show there was a significant interaction effect between biological sex and digit ratio on the right hand, see Table 10. Follow up analyses found that there was a negative correlation between digit ratio of the right hand and experience seeking in males, $r(34) = -.27$, $p = .11$, and a positive correlation in females, $r(88) = .15$, $p = .15$, $p > .05$.

Risky Impulsive Self-destructive Behavior Questionnaire. All analyses for the RISQ were run at an alpha level of .01. Results show there were significant main effects for biological sex and digit ratio of the left and right hand on lifetime drug behaviors. Additionally, significant interactions were indicated between biological sex and digit ratio of both the left hand and the right hand, see Table 11 and 12. Follow up analysis indicated a significant negative correlation of left digit ratio on lifetime drug behaviors, $r(34) = -.51$, $p = .002$, and right digit ratio on lifetime drug behaviors, $r(34) = -.36$, $p = .03$, in males. The results suggest that a more masculinized digit ratio is associated with higher occurrences of drug behaviors over the lifetime. No significant correlations were found on either hand in females, $r(88) = .01$, $p = .91$, and $r(88) = -.03$, $p = .81$, left and right digit ratio respectively.

Similarly, results show there was a significant main effect of left digit ratio on monthly drug use behaviors, see Table 13. Additional analyses indicate a significant negative correlation between left digit ratio and monthly drug behaviors $r(124) = -.19$, $p = .03$. Therefore, a more masculinized digit ratio suggests higher rates of monthly drug behaviors.

To test the effect of biological sex and digit ratio on lifetime gambling behaviors, two separate general linear models were run to incorporate the digit ratio of either hand,

see Table 14 and 15. Results revealed a significant main effect of biological sex on lifetime gambling behaviors. Follow up results indicate a significant difference in lifetime gambling behaviors between males and females, $t(124) = 3.65, p < .001$, *Cohen's d* = .63. Likewise, biological sex had a significant main effect on gambling behaviors for the past month. This main effect was indicated only in the analysis that included the right digit ratio, see Table 16. Follow up results indicated a significant difference in monthly gambling behaviors between males and females, $t(124) = 2.85, p = .005$, *Cohen's d* = .47. Together, these results suggest that males had a greater likelihood of engaging in both monthly and lifetime gambling behaviors, see Table 1 for male and female means and standard deviations.

Discussion

We initially tested if digit ratio of the right and left hand had any relationship with each other. We found that the digit ratio of both hands was highly correlated, which suggests that both hands are affected similarly be prenatal factors, likely androgen levels. In our first hypothesis, we predicted that the digit ratio of males would be lower than the digit ratio of females on both hands. Our hypothesis was supported, as males were found to have a lower, and thus more masculinized, digit ratio than females. This finding is consistent with previous findings by Manning et al. (1998), in which males had a lower digit ratio compared to females. Likewise, Zheng & Cohn (2011) found that during prenatal fetal development, males had a shorter second digit than fourth digit compared to females, inducing a lower digit ratio among males.

The second hypothesis involved digit ratio as a predictor of sexual orientation in men, dependent on the number of older brothers one has (i.e., the fraternal birth order

effect). Because the fraternal birth order effect occurs only in men, we ran analyses specific to biological sex to determine the relationship (Kangassalo et al., 2011). No significant results were found in males, suggesting digit ratio is not a predictor of sexual orientation, nor dependent on the number of older brothers an individual has. However, more masculinized digit ratios have been linked to heterosexual male orientations and homosexual female orientations. In contrast, some studies found that hyper-masculinized digit ratios were common among homosexual men, rather than the straightforward 2D:4D theory that homosexual males are exposed to lower levels of prenatal androgen and portray a higher 2D:4D ratio (Lippa, 2003; Robinson & Manning, 2000). Even when disregarding the number of older brothers as a factor, no significant relationship was determined between digit ratio of either hand and sexual orientation. Thus, our hypothesis describing the relationship between digit ratio, sexual orientation, and number of older brothers was not supported, although there is a glaring potential cause for lack of significant results. Of the 36 male participants, five identified as non-heterosexual, limiting the power in the analysis.

Our third hypothesis investigated whether a more masculinized digit ratio linked to certain personality traits, particularly sensation-seeking and impulsivity, after controlling for sex. Likewise, Wacker et al. (2013) previously suggested examining more specific personality traits that might uniquely associate with digit ratio. We used the SAPA Personality Inventory (Condon, 2017), which examined the common five-factor traits, as well as 27 more specific personality traits. Our results indicated no significant relationship between digit ratio and the five-factor traits of extraversion, neuroticism, openness, agreeableness, and conscientiousness. These results are inconsistent with

previous findings by Fink et al. (2004), in which women with higher 2D:4D ratios on the right hand had higher neuroticism and lower agreeableness. Of the more specific 27-factor traits, the only significant relationship indicated was between emotional stability and biological sex, regardless of digit ratio on either hand. Results showed men to be more emotionally stable than women. A study by Stavropoulos, Moore, Lazaratou, Dikaios, and Gomez (2017) found that the emotional stability personality sub-trait served as a protective factor against certain mental health symptoms in men, including obsessive compulsive symptoms. Our hypothesis that specific sensation seeking and impulsive personality traits yield more consistent correlations with digit ratio was not supported, as emotional stability was the only significant finding.

Our fourth and final hypothesis explored whether digit ratio, after controlling for sex, was associated with sensation seeking and risky, impulsive behaviors. Multiple significant interactions were found between digit ratio and biological sex on measures of both surveys, as well as significant main effects. Overall sensation seeking, boredom susceptibility, disinhibition, and experience seeking were significantly associated with lower, or more masculinized, digit ratios in males than females. Previous findings by Fink et al. (2006) indicated overall sensation seeking and boredom susceptibility to mirror our results. These findings suggest multiple types of sensation seeking behaviors are linked to masculinized digit ratio, and lower digit ratio in males has been shown to indicate higher levels of prenatal testosterone exposure while in utero. Therefore, part of our fourth hypothesis supports digit ratio as an accurate indicator of underlying prenatal androgen exposure in males, subjecting them to greater sensation seeking tendencies in early adulthood (Fink et al., 2006).

Similar to sensation seeking behaviors, certain types of risky, impulsive, and self-destructive behavior were found to be significantly related to digit ratios. A significant interaction between biological sex and digit ratio was found on lifetime drug behaviors, such that a more masculinized digit ratio was associated with greater lifetime drug use, but only in men. Furthermore, more masculinized 2D:4D ratios, indicated by a significant main effect of digit ratio, suggested higher rates of monthly drug behaviors, regardless of biological sex. Digit ratio, and by extension prenatal hormone exposure, was again found to play a role in certain risky and impulsive behaviors. These findings also suggest that men, who are more likely to possess a more masculinized digit ratio, are at greater risk of engaging in behaviors that are often characterized as maladaptive or even dangerous. Indeed, we also found that males had a greater likelihood of engaging in monthly and lifetime gambling behaviors. Although no previous research has been done on the relationship between digit ratio and the RISQ, Kim & Kim (2014) found that overall risk-taking behaviors were higher in men than in women. Overall, results from both the Sensation Seeking Scale and the Risky, Impulsive, and Self-destructive Behaviors Questionnaire support our final hypothesis.

Limitations

As previously discussed, the sample size in this study served as a major limitation. Namely, the lack of significant findings in our second hypothesis on male birth order effect and sexual orientation. There are conflicting reports in the literature on whether or not digit ratio is an accurate predictor of sexual orientation, and whether there is a positive or negative relationship evident (Blanchard, 2001; Lippa, 2003). The fraternal birth order effect may or may not be as strong as previously reported by

Kangassalo et al. (2011), but it was difficult to sufficiently test the relationship between sexual orientation and digit ratio as we did not have a sufficient number of male participants.

An additional limitation to this sample was the age of the participants. Although males were found to have higher rates of drug use and gambling over their lifetime, many of them were younger than the legal age for these behaviors and underreporting of these behaviors may have minimized true differences. Furthermore, we do not know if these differences in young adulthood continue later in life.

Geographic location may have been another limitation of this study. A study by Oswald and Culton (2003) surveyed lesbian, gay, bisexual, and transgender individuals from 38 rural Illinois counties and found that people in these areas reported homophobia and bigotry as the worst part about living in their community. While this study is from over a decade ago, this finding may play a role in the lack of non-heterosexual participation or disclosure in this study.

Lack of multiple digit ratio measurements was also a limitation. The same researcher recorded all the measurements, and only a single measurement was taken for either digit on the right and left hand. In future studies, it is suggested to take multiple measurements of the same finger to increase reliability. Additionally, should the resources be available, utilizing more than one researcher to take live measurements is also suggested.

A final limitation was the oversight of not asking participants about hormonal imbalances or injuries to digits that may have affected digit ratio measurements. An additional oversight was the lack of race and ethnicity incorporated into the requested

demographic information. Although past studies have found consistent results in digit ratio across ethnicities (Lippa, 2003), others like Manning, Churchill, & Peters (2007) have not, indicating that the effect of race and ethnicity of digit ratio may play a role in interpreting results.

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Appendix

Table 1

Means and Standard Deviations (SD) by Biological Sex

Measure	Males, n = 36	Females, n = 90
Left digit ratio	.96 (.04)*	.98 (.04)*
Right digit ratio	.97 (.04)*	.98 (.04)*
Number of Older Brothers	.40 (.65)	.54 (.89)
Sensation Seeking (total)	19.11 (6.52)*	17.30 (5.81)*
Sensation Seeking (boredom susceptibility)	3.00 (1.96)*	2.16 (1.53)*
Sensation Seeking (disinhibition)	5.61 (2.59)*	4.45 (2.50)*
Sensation Seeking (experience seeking)	5.31 (2.33)*	5.16 (1.80)*
Sensation Seeking (thrill and adventure seeking)	5.19 (2.81)	5.54 (2.63)
RISQ (total – lifetime)	1.47 (.97)	1.20 (.67)
RISQ (total – month)	.81 (.40)	.80 (.40)
RISQ (drug behaviors – lifetime)	1.42 (1.34)**	.66 (.67)**
RISQ (drug behaviors – month)	.42 (.50)**	.32 (.47)**
RISQ (aggression – lifetime)	.77 (.83)	.50 (.60)
RISQ (aggression – month)	.14 (.35)	.10 (.30)
RISQ (gambling– lifetime)	.92 (1.18)**	.32 (.63)**
RISQ (gambling – month)	.22 (.42)**	.06 (.23)**
RISQ (risky sexual behaviors – lifetime)	.33 (.48)	.28 (.45)
RISQ (risky sexual behaviors – month)	.11 (.32)	.04 (.21)
RISQ (heavy alcohol use – lifetime)	1.00 (.99)	.67 (.85)
RISQ (heavy alcohol use – month)	.33 (.48)	.32 (.47)
RISQ (self-harm – lifetime)	.64 (.96)	.71 (.97)
RISQ (self-harm – month)	.08 (.28)	.19 (.39)
RISQ (impulse eating – lifetime)	.92(1.40)	.88 (1.25)

RISQ (impulse eating – month)	.36 (.54)	.41 (.58)
RISQ (reckless behaviors – lifetime)	1.56 (1.16)	1.18 (.93)
RISQ (reckless behaviors – month)	.58 (.50)	.67 (.52)

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

Table 2

Means and Standard Deviations (SD) by Biological Sex

Measure	Males, n = 36	Females, n = 90
5-Factor Extraversion	38.74 (7.03)	41.14 (7.43)
5-Factor Neuroticism	28.20 (6.50)	30.89 (7.42)
5-Factor Conscientiousness	34.09 (5.90)	36.41 (8.12)
5-Factor Agreeableness	34.86 (4.59)	37.35 (4.94)
5-Factor Openness	31.11 (4.78)	30.89 (4.46)
27-Factor Compassion	14.26 (2.85)	15.44 (2.37)
27-Factor Irritability	9.74 (3.11)	9.24 (3.23)
27-Factor Intellect	13.31 (2.92)	12.94 (2.77)
27-Factor Authoritarianism	12.97 (2.68)	14.65 (3.05)
27-Factor Charisma	12.77 (2.60)	13.26 (2.98)
27-Factor Emotional Expressiveness	10.49 (3.76)	11.92 (4.35)
27-Factor Conservatism	9.43 (4.43)	10.95 (4.45)
27-Factor Sensation-Seeking	10.03 (3.10)	8.58 (3.04)
27-Factor Anxiety	12.40 (3.69)	13.16 (3.69)
27-Factor Creativity	13.63 (2.72)	14.09 (2.54)
27-Factor Impulsivity	9.49 (3.09)	9.18 (3.58)
27-Factor Trust	11.71 (2.96)	12.07 (3.15)
27-Factor Humor	14.00 (2.54)	14.99 (2.71)
27-Factor Introspection	13.69 (2.72)	14.22 (2.89)
27-Factor Perfectionism	12.80 (2.86)	12.67 (3.03)
27-Factor Self-Control	10.20 (3.23)	10.43 (2.86)
27-Factor Conformity	9.97 (4.47)	11.90 (4.05)
27-Factor Easy-Goingness	12.60 (2.83)	12.43 (2.47)
27-Factor Adaptability	12.40 (2.78)	11.33 (3.35)
27-Factor Emotional Stability	10.54 (2.75)**	7.69 (2.98)**
27-Factor Sociability	11.49 (2.86)	12.39 (3.16)

27-Factor Well-Being	13.09 (3.44)	13.25 (3.94)
27-Factor Honesty	13.77 (2.90)	15.01 (2.74)
27-Factor Industry	9.40 (2.69)	10.77 (3.44)
27-Factor Attention-Seeking	9.46 (4.24)	9.67 (3.99)
27-Factor Order	11.23 (3.77)	11.72 (4.10)
27-Factor Art Appreciation	13.49 (3.62)	14.00 (3.80)

* $p < .01$, ** $p < .002$

Table 3

Univariate Analysis of Variance for the Emotional Stability Score of the 27-Factor SAPA Personality Inventory of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	182.44	1	182.44	21.77	.000*	.16	.996
Main Effect of Left Digit Ratio (Centered)	4.78	1	4.78	.57	.45	.01	.12
Interaction Effect	13.47	1	13.47	1.61	.21	.01	.24
Residual	997.22	119	8.38				

* Significant at $p < .002$

Table 4

Univariate Analysis of Variance for the Emotional Stability Score of the 27-Factor SAPA Personality Inventory of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	190.37	1	190.37	22.64	.000*	.16	.997
Main Effect of Right Digit Ratio (Centered)	1.72	1	1.72	.20	.65	.002	.07
Interaction Effect	16.61	1	16.61	1.98	.16	.02	.29
Residual	1000.43	119	8.41				

* Significant at $p < .002$

Table 5

Univariate Analysis of Variance for the Total Score of the Sensation Seeking Scales of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	26.17	1	26.17	.74	.39	.01	.04
Main Effect of Left Digit Ratio (Centered)	107.81	1	107.81	3.06	.08	.03	.20
Interaction Effect	179.04	1	179.04	5.09	.03*	.04	.36
Residual	4257.43	121	35.19				

* Significant at $p < .05$

Table 6

Univariate Analysis of Variance for the Total Score of the Sensation Seeking Scales of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	25.30	1	25.30	.73	.40	.01	.04
Main Effect of Right Digit Ratio (Centered)	130.67	1	130.67	3.77	.054	.03	.25
Interaction Effect	239.27	1	239.27	6.91	.01*	.05	.51
Residual	4193.19	121	34.65				

* Significant at $p < .05$

Table 7

Univariate Analysis of Variance for Boredom Susceptibility of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	9.10	1	9.10	3.42	.07	.03	.23
Main Effect of Right Digit Ratio (Centered)	14.19	1	14.19	5.34	.02*	.04	.38
Interaction Effect	10.88	1	10.88	4.09	.045*	.03	.28
Residual	321.85	121	2.66				

* Significant at $p < .05$

Total 8

Univariate Analysis of Variance for Boredom Susceptibility of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	8.91	1	8.91	3.32	.07	.03	.44
Main Effect of Left Digit Ratio (Centered)	12.67	1	12.67	4.73	.03*	.04	.58
Interaction Effect	8.89	1	8.89	3.32	.07	.03	.44
Residual	324.42	121	2.68				

* Significant at $p < .05$

Table 9

Univariate Analysis of Variance for Disinhibition of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	17.15	1	17.15	2.76	.10	.02	.38
Main Effect of Left Digit Ratio (Centered)	19.78	1	19.78	3.18	.08	.03	.42
Interaction Effect	24.88	I	24.88	3.999	.048*	.03	.51
Residual	752.92	121	6.22				

* Significant at $p < .05$

Table I0

Univariate Analysis of Variance for Experience Seeking of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	.001	1	.001	.000	.985	.000	.05
Main Effect of Right Digit Ratio (Centered)	2.97	1	2.97	.79	.38	.01	.14
Interaction Effect	20.70	1	20.70	5.53	.02*	.04	.65
Residual	452.72	121	3.74				

* Significant at $p < .05$

Table 11

Univariate Analysis of Variance for Drug Behaviors Over a Lifetime of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	6.81	1	6.81	9.54	.002*	.07	.87
Main Effect of Left Digit Ratio (Centered)	11.08	1	11.08	15.53	.000*	.11	.97
Interaction Effect	11.63	1	11.63	16.30	.000*	.12	.98
Residual	87.08	122	.71				

* Significant at $p < .01$

Table 12

Univariate Analysis of Variance for Drug Behaviors Over the Lifetime of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	8.92	1	8.92	11.47	.001*	.09	.92
Main Effect of Right Digit Ratio (Centered)	6.22	1	6.22	7.998	.005*	.06	.80
Interaction Effect	5.34	1	5.34	6.87	.01*	.05	.74
Residual	94.86	122	.78				

* Significant at $p < .01$

Table 13

Univariate Analysis of Variance for Drug Behaviors Over the Last Month of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	.002	1	.002	.01	.92	.000	.05
Main Effect of Left Digit Ratio (Centered)	1.76	1	1.76	8.15	.005*	.06	.81
Interaction Effect	1.22	1	1.22	5.67	.02	.04	.66
Residual	26.29	122	.22				

* Significant at $p < .01$

Table 14

Univariate Analysis of Variance for Gambling Behaviors Over the Lifetime of the Left Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	7.54	1	7.54	10.94	.001*	.08	.91
Main Effect of Left Digit Ratio (Centered)	.31	1	.31	.44	.51	.004	.10
Interaction Effect	.04	1	.04	.05	.82	.000	.06
Residual	84.10	122	.69				

* Significant at $p < .01$

Table 15

Univariate Analysis of Variance for Gambling Behaviors Over the Lifetime of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	9.72	1	9.72	14.17	.000*	.10	.96
Main Effect of Right Digit Ratio (Centered)	.71	1	.71	1.04	.31	.01	.17
Interaction Effect	.12	1	.12	.17	.68	.001	.07
Residual	83.70	122	.69				

* Significant at $p < .01$

Table 16

Univariate Analysis of Variance for Gambling Behaviors Over the Last Month of the Right Hand

Sources of Variance	*SS*	*df*	*MS*	*F*	*p*	*Partial Eta Square*	*Power*
Main Effect of Biological Sex	.74	1	.74	8.41	.000*	.16	.998
Main Effect of Right Digit Ratio (Centered)	.004	1	.004	.05	.83	.00	.06
Interaction Effect	.14	1	.14	1.55	.22	.01	.24
Residual	10.80	122	.09				

* Significant at $p < .01$

Demographics

Please answer the following demographic questions.

What is your biological gender (gender assigned to you at birth)?

- Male
- Female

Do you currently identify with your biological gender (gender assigned to you at birth)?

- Yes
- No

Display This Question:
What gender do you identify as?

- Male
- Female

If "Do you currently identify with your biological gender (gender assigned to you at birth)?" = No

What is your sexual orientation?

- Heterosexual (straight)
- Non-heterosexual

Display This Question:
What sexual orientation do you identify as (gay, lesbian, bisexual, pansexual, asexual, etc.)?

_____

If "What is your sexual orientation?" = Non-heterosexual

What year in school are you?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate

How old are you?

_____

How many older siblings do you have (biological older siblings from the same mother)?

- 0
- 1
- 2
- 3
- 4
- 5+

Display This Question:
How many older brothers do you have (biological older brothers from the same mother)

If "How many older siblings do you have (biological older siblings from the same mother)?" = 1

Or "How many older siblings do you have (biological older siblings from the same mother)?" = 2

Or "How many older siblings do you have (biological older siblings from the same mother)?" = 3

Or "How many older siblings do you have (biological older siblings from the same mother)?" = 4

Or "How many older siblings do you have (biological older siblings from the same mother)?" = 5+

Please enter your 4-digit participant code in the space below.

Sensation Seeking Scale

Directions: Each of the items below contains two choices, A and B. Please indicate which of the choices most describes your likes or the way you feel. In some cases, you may find items in which both choices describe your likes or feelings. Please choose the one which better describes your likes or feelings. In some cases, you may find items in which you do not like either choice. In these cases, mark the choice you dislike least. Please try to answer each item. It is important you respond to all items with only one choice, A or B. We are interested only in your likes or feeling, not in how others feel about these things or how one is supposed to feel. There are no right or wrong answers as in other kinds of tests. Be frank and give your honest appraisal of yourself.

1.

A. I like "wild" uninhibited parties

B. I prefer quiet parties with good conversation

2.

A. There are some movies I enjoy seeing a second or even a third time

B. I can't stand watching a movie that I've seen before

3.

A. I often wish I could be a mountain climber

B. I can't understand people who risk their necks climbing mountains

4.

A. I dislike all body odors

B. I like some of the earthly body smells

5.

A. I get bored seeing the same old faces

B. I like to comfortable familiarity of everyday friends

6.

A. I like to explore a strange city or section of town by myself, even if it means getting lost

B. I prefer a guide when I am in a place I don't know well

7.

A. I dislike people who do or say things just to shock or upset others

B. When you can predict almost everything a person will do and say he or she must be a bore

8.

A. I usually don't enjoy a movie or play where I can predict what will happen in advance

B. I don't mind watching a movie or a play where I can predict what will happen in advance

9.

A. I have tried marijuana or would like to

B. I would never smoke marijuana

10.

A. I would not like to try any drug which might produce strange and dangerous effects on me

B. I would like to try some of the new drugs that produce hallucinations

11.

A. A sensible person avoids activities that are dangerous

B. I sometimes like to do things that are a little frightening

12.

A. I dislike "swingers" (people who are uninhibited and free about sex)

B. I enjoy the company of real "swingers"

13.

A. I find that stimulants make me uncomfortable

B. I often like to get high (drinking liquor or smoking marijuana)

14.

A. I like to try new foods that I have never tasted before

B. I order the dishes with which I am familiar, so as to avoid disappointment and unpleasantness

15.

A. I enjoy looking at home movies or travel slides

B. Looking at someone's home movies or travel slides bores me tremendously

16.

A. I would like to take up the sport of water skiing
B. I would not like to take up water skiing

17.

A. I would like to try surf boarding
B. I would not like to try surf boarding

18.

A. I would like to take off on a trip with no preplanned or definite routes, or timetable
B. When I go on a trip I like to plan my route and timetable fairly carefully

19.

A. I prefer the "down to earth" kinds of people as friends

B. I would like to make friends in some of the "far out" groups like artists or "punks"

20.

A. I would not like to learn to fly an airplane

B. I would like to learn to fly an airplane

21.

A. I prefer the surface of the water to the depths

B. I would like to go scuba diving

22.

A. I would like to meet some persons who are homosexual (men or women)

B. I stay away from anyone I suspect of being "gay or lesbian"

23.

A. I would like to try parachute jumping

B. I would never want to try jumping out of a plane with or without a parachute

24.

A. I prefer friends who are excitingly unpredictable

B. I prefer friends who are reliable and predictable

25.

A. I am not interested in experience for its own sake

B. I like to have new and exciting experiences and sensations even if they are a little frightening, unconventional, or illegal

26.

A. The essence of good art is in its clarity, symmetry of form and harmony of colors

B. I often find beauty in the "clashing" colors and irregular forms of modern paintings

27.

A. I enjoy spending time in the familiar surroundings of home

B. I get very restless if I have to stay around home for any length of time

28.

A. I like to dive off the high board

B. I don't like the feeling I get standing on the high board (or I don't go near it at all)

29.

A. I like to date members of the opposite sex who are physically exciting

B. I like to date members of the opposite sex who share my values

30.

A. Heavy drinking usually ruins a party because some people get loud and boisterous (rowdy)

B. Keeping the drinks full is the key to a good party

31.

A. The worst social sin is to be rude

B. The worst social sin is to be a bore

32.

A. A person should have considerable sexual experience before marriage

B. It's better if two married persons begin their sexual experience with each other

33.

A. Even if I had the money I would not care to associate with flight rich persons like those in the "jet set" (wealthy and fashionable people who travel widely and frequently for pleasure)

B. I could conceive of myself seeking pleasures around the world with the "jet set"

34.

A. I like people who are sharp and witty even if they do sometimes insult others

B. I dislike people who have their fun at the expense of hurting the feelings of others

35.

A. There is altogether too much portrayal of sex in movies

B. I enjoy watching many of the "sexy" scenes in movies

36.

A. I feel best after taking a couple of drinks

B. Something is wrong with people who need liquor to feel good

37.

A. People should dress according to some standard of taste, neatness, and style

B. People should dress in individual ways even if the effects are sometimes strange

38.

A. Sailing long distances in small sailing crafts is foolhardy

B. I would like to sail a long distance in a small but seaworthy sailing craft

39.

A. I have no patience with dull or boring persons

B. I find something interesting in almost every person I talk to

40.

A. Skiing down a high mountain slope is a good way to end up on crutches

B. I think I would enjoy the sensations of skiing very fast down a high mountain slope

SAPA Personality Inventory 81-27&5

Please use the response options to indicate how accurately each phrase or sentence describes you.

	Very Inaccurate (1)	Moderately Inaccurate (2)	Slightly Inaccurate (3)	Slightly Accurate (4)	Moderately Accurate (5)	Very Accurate (6)
q_253 Am sensitive to the needs of others.	☐	☐	☐	☐	☐	☐
q_952 Get angry easily.	☐	☐	☐	☐	☐	☐
q_1904 Usually like to spend my free time with people.	☐	☐	☐	☐	☐	☐
q_578 Dislike myself.	☐	☐	☐	☐	☐	☐
q_1367 Love dangerous situations.	☐	☐	☐	☐	☐	☐
q_4252 Am a worrier.	☐	☐	☐	☐	☐	☐
q_4296 Tell a lot of lies.	☐	☐	☐	☐	☐	☐
q_904 Find it difficult to get down to work.	☐	☐	☐	☐	☐	☐
q_240 Am quick to understand things.	☐	☐	☐	☐	☐	☐
q_2745 Am able to come up with new and different ideas.	☐	☐	☐	☐	☐	☐
q_35 Act without thinking.	☐	☐	☐	☐	☐	☐
q_565 Dislike being the center of attention.	☐	☐	☐	☐	☐	☐
q_1201 Keep things tidy.	☐	☐	☐	☐	☐	☐
q_1624 Respect authority.	☐	☐	☐	☐	☐	☐

q_1045 Have a natural talent for influencing people.	☐	☐	☐	☐	☐	☐
q_1855 Trust what people say.	☐	☐	☐	☐	☐	☐
q_1243 Laugh a lot.	☐	☐	☐	☐	☐	☐
q_219 Am open about my feelings.	☐	☐	☐	☐	☐	☐
q_610 Do not like art.	☐	☐	☐	☐	☐	☐
q_1389 Love to reflect on things.	☐	☐	☐	☐	☐	☐
q_530 Continue until everything is perfect.	☐	☐	☐	☐	☐	☐
q_56 Am able to control my cravings.	☐	☐	☐	☐	☐	☐
q_152 Am just an ordinary person.	☐	☐	☐	☐	☐	☐
q_566 Dislike changes.	☐	☐	☐	☐	☐	☐
q_1329 Like to take it easy.	☐	☐	☐	☐	☐	☐
q_979 Get overwhelmed by emotions.	☐	☐	☐	☐	☐	☐
q_345 Believe in one true religion.	☐	☐	☐	☐	☐	☐
q_90 Am concerned about others.	☐	☐	☐	☐	☐	☐
q_1357 Lose my temper.	☐	☐	☐	☐	☐	☐
q_312 Avoid company.	☐	☐	☐	☐	☐	☐
q_811 Feel a sense of worthlessness or hopelessness.	☐	☐	☐	☐	☐	☐
q_1664 Seek danger.	☐	☐	☐	☐	☐	☐
q_1989 Worry about things.	☐	☐	☐	☐	☐	☐

q_1812 Tell the truth.	☐	☐	☐	☐	☐	☐
q_1744 Start tasks right away.	☐	☐	☐	☐	☐	☐
q_1253 Learn things slowly.	☐	☐	☐	☐	☐	☐
q_128 Am full of ideas.	☐	☐	☐	☐	☐	☐
q_1173 Jump into things without thinking.	☐	☐	☐	☐	☐	☐
q_1027 Hate being the center of attention.	☐	☐	☐	☐	☐	☐
q_1254 Leave a mess in my room.	☐	☐	☐	☐	☐	☐
q_1867 Try to follow the rules.	☐	☐	☐	☐	☐	☐
q_254 Am skilled in handling social situations.	☐	☐	☐	☐	☐	☐
q_4289 Trust people to mainly tell the truth.	☐	☐	☐	☐	☐	☐
q_1244 Laugh aloud.	☐	☐	☐	☐	☐	☐
q_1081 Have difficulty expressing my feelings.	☐	☐	☐	☐	☐	☐
q_348 Believe in the importance of art.	☐	☐	☐	☐	☐	☐
q_1738 Spend time reflecting on things.	☐	☐	☐	☐	☐	☐
q_1915 Want every detail taken care of.	☐	☐	☐	☐	☐	☐
q_736 Easily resist temptations.	☐	☐	☐	☐	☐	☐
q_1300 Like to be thought of as a normal kind of person.	☐	☐	☐	☐	☐	☐
q_689 Don't like the idea of change.	☐	☐	☐	☐	☐	☐

q_1281 Like a leisurely lifestyle.	☐	☐	☐	☐	☐	☐
q_174 Am not easily affected by my emotions.	☐	☐	☐	☐	☐	☐
q_660 Don't consider myself religious.	☐	☐	☐	☐	☐	☐
q_1763 Sympathize with others' feelings.	☐	☐	☐	☐	☐	☐
q_1683 Seldom get mad.	☐	☐	☐	☐	☐	☐
q_1923 Want to be left alone.	☐	☐	☐	☐	☐	☐
q_2765 Am happy with my life.	☐	☐	☐	☐	☐	☐
q_1781 Take risks.	☐	☐	☐	☐	☐	☐
q_4249 Would call myself a nervous person.	☐	☐	☐	☐	☐	☐
q_501 Cheat to get ahead.	☐	☐	☐	☐	☐	☐
q_1444 Need a push to get started.	☐	☐	☐	☐	☐	☐
q_493 Catch on to things quickly.	☐	☐	☐	☐	☐	☐
q_2754 Aman original thinker.	☐	☐	☐	☐	☐	☐
q_1424 Make rash decisions.	☐	☐	☐	☐	☐	☐
q_1416 Make myself the center of attention.	☐	☐	☐	☐	☐	☐
q_1483 Often forget to put things back in their proper place.	☐	☐	☐	☐	☐	☐
q_1609 Rebel against authority.	☐	☐	☐	☐	☐	☐
q_1242 Lack the talent for influencing people.	☐	☐	☐	☐	☐	☐

q_377 Believe that others have good intentions.	☐	☐	☐	☐	☐	☐
q_1248 Laugh my way through life.	☐	☐	☐	☐	☐	☐
q_803 Express myself easily.	☐	☐	☐	☐	☐	☐
q_607 Do not enjoy going to art museums.	☐	☐	☐	☐	☐	☐
q_755 Enjoy examining myself and my life.	☐	☐	☐	☐	☐	☐
q_571 Dislike imperfect work.	☐	☐	☐	☐	☐	☐
q_1590 Rarely overindulge.	☐	☐	☐	☐	☐	☐
q_1653 See myself as an average person.	☐	☐	☐	☐	☐	☐
q_39 Adjust easily.	☐	☐	☐	☐	☐	☐
q_1052 Have a slow pace to my life.	☐	☐	☐	☐	☐	☐
q_793 Experience my emotions intensely.	☐	☐	☐	☐	☐	☐
q_1824 Tend to vote for conservative political candidates	☐	☐	☐	☐	☐	☐

Risky Impulsive Self-Destructive Behavior Questionnaire

For each behavior, fill-in how many times you did it in your lifetime (A) & the total number of times you did it the past month (B).

Enter one number for each time period, even if it is your best guess. Please do not put a range, but enter a single number (e.g., behaviors engaged in everyday for multiple years can be written in as 1000+, behaviors engaged in daily for a single year can be written in as 365, any other frequency should be estimated using your best guess).

If you have ever done the behavior, write how old you were the first time (C) and answer yes or no (D) if the behavior ever caused you any problems, regardless of the specific problem. For the last two columns (E & F), use the scale in the box to rate how much you agree with each statement from 0 = Strongly Disagree to 4 = Strongly Agree. ***Please provide ratings for both statements (E & F), and treat them as separate questions.***

If you have never done the behavior, please write a "0" in column A and move on to the next behavior.

	A How many times total have you done this in your life?	**B** How many times have you done this in the past month?	**C** How old were you the first time?	**D** Did it ever cause you any problems? (Such as, going to the hospital, legal trouble, problems at work, with family or friends)	**E** I do this behavior to stop feeling upset, distressed, or overwhelmed *Rate 0 (strongly disagree) - 4 (strongly agree)*	**F** I do this behavior to feel excitement, to get a thrill, or to feel pleasure *Rate 0 (strongly disagree) - 4 (strongly agree)*
	# TOTAL	# in past MONTH	Age	Yes (1) No (2)	0 - Strongly Disagree 1 - Somewhat Disagree 2 - Equally Disagree/Agree 3 - Somewhat Agree 4 - Strongly Agree	
1. Shoplifted things						

2. Drove 30 mph or faster over the speed limit					
3. Bet on sports, horses, or other animals					
4. Used cocaine or crack					
5. Bought drugs					
6. Impulsively bought stuff you did not need & won't use					
7. Had unprotected sex with someone you just met or didn't know well					
8. Gotten into a physical fight					
9. Thought about killing yourself					
10. Had sex for money or drugs					

11. Drank alcohol until you blacked or passed out					
12. Used hallucinogens, LSD, or mushrooms					
13. Gone to work intoxicated or high					
14. Attacked someone with a weapon, such as a knife or gun					
15. Punched or hit someone with a fist or object					
16. Cut, burned, or hurt yourself on purpose without trying to die					
17. Lost more money than you could afford gambling					
18. Threatened to physically hurt someone					
19. Threatened someone with a					

weapon, such as a knife or gun					
20. Used heroin					
21. Destroyed or vandalized property					
22. Drank 5 or more alcoholic drinks in 3 hours or less					
23. Paid for sex					
24. Sold drugs					
25. Robbed someone					
26. Tried to kill yourself					
27. Used marijuana					
28. Had difficulty stopping eating					

29. Been in 2 or more sexual relationships at the same time					
30. Bought expensive items you could not afford in the spur of the moment					
31. Abused multiple drugs at once					
32. Played lotteries, card games for money, or went to the casino					
33. Gambled illegally (not part of a legal business, using a bookie)					
34. Abused prescription medication					
35. Ate a lot of food when not hungry					
36. Had a plan to kill yourself					

37. Ran red lights or ignored stop signs					
38. Stole money					