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Signature size signals sociable dominance and narcissism

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ABSTRACT

Handwritten signatures have been traditionally associated with personality traits. In this study, we examined the relationship of signature size with intrasexual competition, aggressive and sociable dominance, narcissism, and self-esteem in a sample of Uruguayan university students (N = 340). The study went methodologically beyond current research by examining three different operationalizations of signature size, and by controlling for potential confounders: number of characters in the printed name, average character area in the printed name—a proxy for overall writing size—, and signature style. After controlling for these potential confounders and demographic variables, our results showed a significant link between signature size and sociable dominance, both for males and females, while narcissism was only in females significantly associated with signature size.

1. Introduction

Handwritten signatures have been considered for long to reflect motor behavior intimately related to deep-lying personality traits (e.g., Allport, Vernon, & Powers, 1933; Eisenberg & Reichline, 1939; Zweigenhaft & Marlowe, 1973). The alleged association between personality traits and handwriting did not go without criticism. Nearly a century ago, Hull and Montgomery (1919) argued that the correlation between different handwriting attributes and personality traits was practically nonexistent. Indeed, the few studies that have addressed the association between handwriting characteristics and personality traits, provide very weak to no evidence in support of the inferring power of graphology (Furnham & Gunter, 1987; King & Koehler, 2000; Klimoski & Rafaeli, 1983; Neter & Ben-Shakhar, 1989).

A few studies, instead of relying on the postulates of graphology, took a different approach and analyzed particular attributes of handwritten signatures in relation to personality traits. In a series of studies, Zweigenhaft (1970, 1977), Zweigenhaft and Marlowe (1973) observed that signature size was positively associated with status and self-esteem. Similar results were obtained by Swanson and Price (1972) in a related study; however, Mahoney (1973) failed to find significant associations between signature size and self-estimation. In a similar vein, Jorgenson (1977) reported a positive correlation between signature size and dominance for women ($r = 0.45$, $p < 0.001$), but not for men ($r = 0.07$, ns). Recently, Ham, Seybert, and Wang (2013) reported a positive correlation between normalized signature size—i.e., signature area divided by the number of characters—and narcissism ($r = 0.45$, $p < 0.01$) in a sample of graduate business students. Furthermore, these authors observed that CEO normalized signature area was negatively correlated with firm performance—measured by return on assets (ROA)—and positively correlated with CEO compensation (Ham et al., 2013). Experimental evidence for the importance of signature size comes from a study by Rawal and co-workers who found that, following a positive-affect priming task, signature size increased relative to the non-affective control condition (Rawal, Harmer, Park, O'Sullivan, & Williams, 2014). Finally, it must be noted that a study by Dillon (1988) showed that women who embellished their signatures on a birthday card had significantly higher narcissism scores that women who did not; however, no association between narcissism and signature embellishment was observed for men.

There is also some evidence for *effects* of drawing one's signature on self-related behaviors. Kettle and Häubl (2011) observed that signing one's name can affect subsequent purchasing behaviors in domains close to one's self-identity, probably by prompting a stronger sense of self-identity. Similarly, it has been shown that signing at the beginning of a document—rather than at the end—decreases dishonest self-reports (Shu, Mazar, Gino, Ariely, & Bazerman, 2012) allegedly by activating attention to oneself, and

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thus making a person's moral concepts more salient. In a related study, Chou (2015) found that this effect is elicited by handwritten signatures and not by e-signatures, since the latter evoke a weaker sense of self-presence.

Some previous studies which reported an association between personality traits and signature size used rather small samples (e.g., Ham et al., 2013; Swanson & Price, 1972; Zweigenhaft, 1970, 1977; Zweigenhaft & Marlowe, 1973), or somewhat lax operationalizations of personality traits—e.g., some studies equated professional development to status or self-esteem (Swanson & Price, 1972; Zweigenhaft & Marlowe, 1973). In addition, most prior studies used a rather restricted approach to signature size analysis, i.e., they only included signatures matched for number of characters, or normalized signature areas—i.e., signature area divided number of characters included in the signature—thus limiting the sample to legible signatures (Ham et al., 2013; Swanson & Price, 1972; Zweigenhaft, 1970, 1977; Zweigenhaft & Marlowe, 1973). However, it should be noted that only a fraction of handwritten signatures are actually readable. Mohammed, Found, and Rogers (2008) observed that only 44.2% of males produced legible signatures, while 70.4% of women's signatures were readable. Furthermore, this bias in signature legibility was statistically significant (Mohammed et al., 2008). Thus, matching signatures by number of characters, or normalizing signature area by number of letters—which implies the use of fully readable signatures only—may fail to capture the full extent of the influence of sex on handwritten signatures, and thus interfere with the characterization of the association of signatures and personality traits.

Most previous studies, which explored the association of handwritten signatures and personality traits, analyzed the relationship of signature size with (social) status, self-esteem, dominance, and narcissism. This research aimed at furthering the study of the relationship of signature size and these personality traits. In addition, given that narcissism has been previously related to self-enhancement (Grijalva & Zhang, 2015; Wallace, 2011) and rival-derogation (Goncalves & Campbell, 2014; South, Oltmanns, & Turkheimer, 2003), and that these traits are reminiscent of intrasexual competition strategies (Buss, 1988; Buunk & Fisher, 2009; Fisher & Cox, 2011), we also analyzed the potential link between this latter variable and signature size.

Based on the significance of handwritten signatures as representations of the self (Chou, 2015; Kettle & Häubl, 2011; Shu et al., 2012), and that a large signature can be seen as a sign of high self-esteem, and an inclination to dominate others, we hypothesized a positive association of signature size and the expansive personality traits considered in this study.

We tried to overcome methodological limitations of previous research in this area in several ways. First, we examined various measures of signature size. Size determination of complex shapes or bodies poses both theoretical and practical challenges. Following the pioneer work by Zweigenhaft (1970), in psychological research, signature size has been traditionally measured as the area of the minimal rectangle, or bounding box—orthogonal to the page—which contains the handwritten signature. In addition to this method, we explored two additional operationalizations of signature size: the minimal rotated bounding box area, and the convex hull area (see Fig. 1).

A second way in which our study went, methodologically, beyond previous research was that we controlled for a number of potentially confounding variables, i.e., number of characters in printed name—an indicator of a person's name length—, the average character area in the printed name—a proxy for overall writing size—and signature style (signatures based on monograms or initials vs extended signatures).

Finally, since signatures and printed names appear to differ in their ability to elicit self-feelings (Kettle & Häubl, 2011), we also explored the association between the previously mentioned personality traits and the metrics of the participants' printed name.

2. Method

2.1. Participants

The sample consisted of male and female students enrolled in the Psychology degree at Universidad de la República, a large public university in Montevideo, Uruguay. All participants were native Spanish speakers, and all questionnaires were administered in Spanish. Since there are very few cross-sectional studies which examine the relationship between signature size and personality traits, and given that we hypothesized that if such associations existed, they would exhibit low to moderate effect sizes, we aimed for a minimum sample consisting of 150 males and 150 females. We allowed an excess of female participants since their data was easier to collect, provided that the male-to-female proportion was at least 3:4.

192 females, and 148 males, ages between 18 and 52 years (M = 23.8, SD = 7.0) returned the completed forms. 5 participants did not sign the forms, and an additional 5 participants did not provide a printed name, and were therefore excluded from some of the analyses. Some participants failed to answer one or more items from the different administered questionnaires; this explains why the number of participants slightly differs between the different analyses. Data analyses were not conducted until the data from all participants was collected. All procedures of the study were approved by the university's ethical review committee. Participants gave their informed written consent to participate in this study.

2.2. Signature and printed name metrics

Participants provided both their signatures and names in print on the consent form, which included half a page of blank space, so that no limitations on (normal) signature size were imposed.

Number of characters in printed names was assessed by visual inspection. Spaces—e.g. between name and surname—and periods were computed as characters, since they influence the total area of the printed name, and thus the average character area. Average character area was calculated by dividing the total area of the printed name (see below) by number of characters included.

Upon visual inspection of the signatures, two different signing styles were readily identified: signatures based on initials, monograms or paraphs; and extended signatures (text based, stylized text or mixed). Signatures were assigned to one of these categories by three independent researchers. When there was no consensus on signature classification, the signature style assigned by consensus. Inter-rater agreement for signature style was 92.7% with a Fleiss' kappa value of 0.85. A significant association between signature style and sex was observed: 25% of males versus 9% of females produced monogram-based signatures ($\chi^2 = 13.70$, $p < 0.001$).

Signatures and printed names were digitized at 300 dpi using a flatbed scanner (CanoScan LiDE 100 Canon Scanner). The resulting images were binarized into black and white images (desaturation by luminosity; threshold levels: 210, 255) using GIMP 2.8 software. The binary images were then visually inspected, and any observed speckles were individually removed. Subsequently, black and white images were processed with aid of GNU Octave software (http://www.octave.org). The features extracted for each signature and printed name were the bounding box area (area of the minimal rectangle—orthogonal to the page—containing the signature), and the convex hull area (area of the minimal convex shape containing the signature), (see Fig. 1). Following Swanson and Price (1972),