

Attachment and language use in donor-conceived adults' self-narratives

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Assisted reproduction with donor gametes (i.e., eggs, sperm) entails the formation of new kinds of families, giving rise to new concepts such as “donor,” “social father,” and “social mother.” These ideas can be understood within an attachment theoretical framework. The present study examined whether individual differences in attachment predict language use in donor-conceived adults' self-narratives. In particular, we focused on meaning-making (McAdams & McLean 2013), in addition to three other aspects of written text: Relational words (i.e., father, dad), non-relational words (i.e., donor, sperm), and “social” parent words (e.g., “my social father always picked me up from school”) that participants used to describe their donor conception experience. Data were collected from 488 donor-conceived people from the Donor Sibling Registry (DSR). Results indicated no association between attachment and meaning-making, nor relational and non-relational words. However, we found that people who were anxiously attached (with respect to their close relationships in general) were more likely to endorse the term “social” parent; those who were avoidant were less likely to use this terminology when writing about their donor conception experience. These results, combined with other exploratory findings, suggests that insecurely attached DC adults may construct their narrative identities differently than their secure counterparts.

Keywords: attachment, donor conception, LIWC

1. Introduction

Individuals who are donor-conceived (DC) may experience unique and complex family relationships with their biological parent(s), non-biological parent(s), and donor. Adding to this complexity is the notion that DC-related terminology is highly contested among those in the donor conception community. For instance, the use of the word ‘father’ to refer to the sperm donor (even in the term ‘biological father’) is strongly opposed

by some individuals. Recent research has highlighted the importance of language and “family words” in discussing relationships in the context of assisted reproduction (Bartholomaeus & Riggs 2019; Hertz Nelson & Kramer 2013), while other work has called attention to the limitations of conceptualizing “parenthood” as a two-parent-nuclear-construct (Cammu 2017).

Despite this evidence, we still don’t understand language use in relation to the enduring family bonds that develop between children and their parents – their attachment figures (Ainsworth 1973; Bowlby 1969). Although language use can be used to more fully understand the emotional content and processing of adults’ discourse in relation to attachment style (Borelli et al. 2013), it is uncertain whether attachment may be predictive of natural language use. Language use is an observable behavior that can provide a rich psychological perspective above and beyond self-reports. Thus, the purpose of the present study was to investigate whether individual differences in attachment are manifested in DC adults’ language use during the construction of a self-narrative.

2. Attachment and Donor Conception

Bowlby, the father of attachment theory (1969, 1973), argued that mental representations of the self and others (i.e., working models) inform a range of affects, cognitions, and behaviors relevant to social interactions, social relationships, and self-construal throughout one’s life. Primary caregivers who are available and responsive to a child’s needs bolster the child’s sense of security. The secure child knows that the caregiver is dependable and is able to use the caregiver as a secure base for exploring the environment. Conversely, unpredictable or unreliable caregiving can lead to insecure attachment, which may, in turn, inhibit exploration.

Attachment theory emphasizes individual differences in the way people experience their relationships. For example, some people are comfortable opening up to others emotionally, whereas others are reluctant to do so. According to attachment research, there are two fundamental ways in which people differ from one another in the way they think about relationships (Brennan, Clark & Shaver 1998). First, some people are more anxious than others. Those who are high in *attachment-related anxiety* tend to fear rejection and worry about whether others really love them. Second, some people are more avoidant than others. Those who are high in *attachment-related avoidance* are less comfortable depending on others and opening up to them.

Although it is possible that some donor-conceived people may be generally secure or insecure in their relationships in general, donor-conceived people may be more insecure with some targets (i.e., their non-biological, “social” parent) than others (e.g., their biological parent). This idea has been supported by research on attachment and donor conception (Lozano, Fraley & Kramer 2019), showing that individual differences in attachment may differ by parental target (i.e., biological vs. non-biological). More specifically, it was found that people reported more attachment anxiety and avoidance in their relationships with their non-biological, “social” parents than their biological parents. Furthermore, attachment style was related to people's curiosity about donor conception, further underscoring the need to examine parent-child relationships in donor-conceived families.

3. Attachment and Language Use

The language of genetics and parent-child relationships is becoming more complex as new technologies emerge and new concepts arise in the context of family and identity. The advent of these new technologies raises a number of new questions, such as “What do we call the person who donated their sperm or eggs to produce a child?” A donor? A biological [genetic] mother/father? A parent? Many donor-conceived people contest the meaning we should attach to the language that is used to describe this person. Ehrensaft (2008), for example, has argued that the term ‘father’ should be used to name the male person who intended to have a child. Nonetheless, research on the terminology used to discuss third-party reproduction has suggested that ‘donor’ is the most common term for those who provide sperm (Beeson, Darnovsky & Lippman 2015).

Moreover, research has shown that parents may experience difficulties finding appropriate language to talk about donor conception. Couples are often uncertain which labels they should use to refer to the donor (Freeman, Bourne, Jadvá & Smith 2014), and many report frustration from “struggling to find unambiguous terminology” (Mac Dougall, Becker, Scheib & Nachtigall 2007:530). Work by Mac Dougall et al. (2007) found that parents use conception narratives in such a way that minimizes the role of the donor, thereby legitimizing the role of the parents who raised the child. That is, families might downplay the importance of the donor by using words that deny the donor’s personhood, for instance, by reducing this person to an ‘instrument’ (e.g. Wyverkens et al. 2014) or by referring to the donation as just a ‘donated cell’ or ‘piece of genetic material’.

In addition to parent-perceived difficulties with terminology, donor-conceived individuals also report challenges communicating their experiences with family. For instance, work by Beeson, Jennings, and

Kramer (2011) found that DC adolescents raised with two heterosexual parents, compared to other family types, felt the *least* comfortable expressing interest in the donor, and a quarter of respondents felt unable to discuss their origins with their non-biological, social parent. This hesitation to speak openly about the donor is most likely a result of safeguarding, or protecting the social parent's feelings. A more recent study by Provoost and colleagues (2017) found that DC children used the terms 'father' or 'daddy' in a particular way. Essentially, participants said the word, then corrected themselves (quickly finding another word to refer to the donor) as if the word 'father' or 'daddy' was a slip of the tongue. Once this occurred, they resumed their description with the intended term (e.g., 'donor').

Taken together, these findings raise the possibility that individual differences in the security of people's parent-child relationships will manifest in the language people use to refer to themselves and their parents. One linguistic feature that may be important for understanding attachment processes in DC individuals is meaning-making (McAdams & McLean 2013). Meaning-making is the process of how people construe, understand, or make sense of life events, relationships, and the self. Put simply, "meaning connects things" (Baumeister 1991:15). Insofar as meaning-making involves an individual's ability to communicate meaning, it follows that meaning-making may be related to open communication about the self as it pertains to donor conception. Therefore, we were interested in whether secure people employ greater meaning-making, going beyond the plot and details of their personal stories to articulate what they believe donor conception says about who they are. Meaning-making is a process central to the development of narrative identity (e.g., McAdams & McLean 2013), and it represents the degree to which the narrator learns something or gleans a message from an event.

We expected that secure people would find more meaning in their DC experience because they have a consistent and reliable attachment figure who attends to their needs of proximity, emotional support, and protection. They are free to explore donor conception, knowing that the parents who have raised them "have their back," so to speak. A competing hypothesis is that insecurely attached adults would demonstrate greater meaning-making, constructing accounts of donor conception that emphasize learning, growth, and positive personal transformation, due in part, to their history with unreliable and rejecting caregivers.

4. The Present Study

The purpose of the present study was to examine whether individual differences in attachment predict language use in donor-conceived adults'

self-narratives. In particular, we focused on four features of written speech: Meaning making (McAdams & McLean 2013), the use of relational words, non-relational words, and the term “social” parent. We have chosen to investigate the content and style of adults’ language use because it represents an effective method for studying the various emotional, cognitive, and structural components present in individuals’ written speech samples (Pennebaker, Mehl & Niederhoffer 2003). Linguistic analysis is advantageous because it lowers the concern for socially desirable responding on questionnaires. Socially desirable responding could be a problem in research on DC offspring because donor assistance remains a taboo topic among those from donor-conceived families (e.g., Indekeu 2015). Text analysis can also be useful because it can reveal patterns of attention or focus of which the writer may not be conscious (Mehl 2006).

Because the present investigation involves the study of natural language use, we chose to use a text analysis program called Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis & Booth 2001) that allows for the analysis of linguistic patterns underlying various psychological constructs. Using a bottom-up, word count–based approach, LIWC operates by comparing each word of the text to an internal dictionary consisting of 74 linguistic and psychological dimensions. The program then provides the relative frequency of each language category (i.e., frequency adjusted by the total number of words). It has been found that LIWC can detect meaning in a wide variety of experimental settings, including attentional focus, emotionality, social relationships, thinking styles, and individual differences (see Tausczik & Pennebaker 2010 for a review).

5. Method

Procedure. The first two authors partnered with the Donor-Sibling Registry (DSR), a non-profit organization serving donor-conceived individuals, sperm/egg donors, and parents who have utilized assisted reproductive technology. The third author (WK) sent a mass email to all 18+ adults belonging to the DSR. The study was also advertised on the organization’s website and social media pages (i.e., Twitter, Facebook). To be eligible to participate, individuals had to be (1) conceived through the use of a sperm or egg donor, (2) carried by a parent rather than a surrogate, and (3) raised in a two-parent household with one biological parent and one non-biological “social” parent. Participants were informed that the research was about personality and individual differences in donor-conceived individuals.

Participation in the study entailed responding to several surveys¹ and writing about the experience of being donor-conceived.

Participants. Four hundred eighty-eight donor-conceived participants took part in the study (312 female, 83 male, 12 non-binary, 1 prefer not to disclose, 80 unreported)². A total of 339 participants (262 female, 65 male, 11 non-binary, 1 prefer not to disclose) provided a response to the following narrative prompt: "Please describe how the experience of donor conception has influenced your life, how it came about, and how it has altered your self-view (if applicable)." Ages ranged from 18 to 74 ($M = 28.76$, $SD = 10.81$). Of those who identified their ethnicity, 88.42% were White, 4.68% Hispanic, 1.78% Asian/Pacific Islander, 1.11% Native American, 0.67% African American (2.90% indicated "Other" and 0.45% chose not to disclose). Most participants were conceived through sperm donation (93.24% sperm donation, 3.69% egg donation, 3.07% not disclosed) and reported coming from a heterosexual family (67.21% heterosexual, 25.61% LGBT, 7.18% not disclosed). With respect to disclosure, approximately 85.5% of participants were told by their parents that they were donor-conceived, 3.30% were told by someone else other than their parents, and 11.55% found out on their own.

Measures.

Adult Attachment. The Experiences in Close Relationships-Relationship Structures (ECR-RS; Fraley, Heffernan, Vicary & Brumbaugh 2011) was administered to assess individual differences in attachment. Participants were asked to complete the 9-item ECR-RS with respect to their general attachment (avoidance: $\alpha = .86$, anxiety: $\alpha = .85$), as well as their attachment to several interpersonal targets: (1) *biological parent* (avoidance: $\alpha = .95$, anxiety: $\alpha = .86$); (2) *non-biological, social parent* (avoidance: $\alpha = .95$, anxiety: $\alpha = .91$); (3) *donor* – if known to the participant (avoidance: $\alpha = .89$, anxiety: $\alpha = .90$). Each item was rated on a Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. Composite scores for each attachment dimension in each relational domain were computed such that

¹ Self-reports were collected as part of a related project on attachment and curiosity/contact in donor-conceived individuals. For more information, refer to our materials on OSF: <https://osf.io/as9bm/>.

² The minimum sample size was determined *a priori*; it was determined that at least 200 people were needed to ensure 80% power to detect population correlations of .20 or higher using a two-tailed test. Thus, we made sure that we collected data from a minimum of 200 people before analyses were conducted. On the basis of unique Qualtrics identifiers, we ensured that participants provided data only once. Online consent was obtained from all participants.

higher scores reflect greater levels of insecure attachment (i.e., avoidance, anxiety).

LIWC Categories. We used the most recent version of the software – LIWC2015 (Pennebaker et al. 2015a). LIWC reads written verbal texts which have been stored in a digital, computer-readable form, such as .csv files. The text analysis module then compares each word in the text against a built-in dictionary. After processing the words in the text, it calculates the percentage of total words that match each of the dictionary categories. Most LIWC2015 output variables are expressed as percentage of total words, with six exceptions: word count (WC; raw word count), (WPS; mean words per sentence), and four summary variables: Analytic, Clout, Authentic, and Tone. Although the LIWC2015 master dictionary is capable of producing approximately 90 output variables, we examined verbal immediacy and affiliation given their proposed connection with attachment and relationship experiences (Borelli, Sbarra, Mehl & David 2011; Schwartz, Lindley & Buboltz Jr. 2007). Because these constructs are not the primary focus of this paper, they are reported in the supplemental materials.

Custom LIWC variables. We created custom LIWC dictionaries (on the basis of common words in the assisted reproduction literature) to analyze (1) relational words (i.e., father, dad), (2) non-relational words about the donor (i.e., donor, sperm), and (3) words involving “social” parents that participants used to describe their donor conception experience. These variables are expressed as percentage of total words. For more information on the creation of custom LIWC variables, consult the LIWC2015 operator manual (2015b:12).

Meaning Making. Four trained coders assigned numerical values for the extent to which the narrator gleaned meaning from their donor conception experience. The coding scheme described in McAdams and McLean (2013) was adapted for our purposes. Scores range from no meaning (1=low score) to learning a concrete lesson (2=moderate score) to gaining a deep insight about life (3=high score). All 339 essays were interpretable. The coders demonstrated good reliability; $\kappa = .85$, ICC = .92, 95% CI [0.90, 0.93].

6. Results

Some of the analyses we report below were pre-registered on the OSF. Many of the analyses we report, however, were not. In the interest of full transparency, we report every analysis we planned to conduct. Some of these results are available as supplementary material on the OSF project page. Descriptive statistics and correlations are depicted in Table 1. All multivariate regressions were fit with the *lavaan* package (Rosseel 2012) in

Table 1. Means, standard deviations, and correlations among all variables

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|------------------------------|--------|-------|--------|--------|-------|-------|--------|--------|--------|-------|-------|------|
| 1. Anxiety (Bio Parent) | 1.00 | | | | | | | | | | | |
| 2. Avoidance (Bio Parent) | 0.72 | 1.00 | | | | | | | | | | |
| 3. Anxiety (Social Parent) | 0.39* | 0.29* | 1.00 | | | | | | | | | |
| 4. Avoidance (Social Parent) | 0.45* | 0.63* | 0.68* | 1.00 | | | | | | | | |
| 5. Anxiety (Donor Parent) | 0.41* | 0.25 | 0.15 | 0.04 | 1.00 | | | | | | | |
| 6. Avoidance (Donor Parent) | 0.19 | -0.03 | 0.12 | -0.22 | 0.31* | 1.00 | | | | | | |
| 7. Anxiety (General) | 0.31* | 0.41* | 0.46* | 0.41* | 0.27 | 0.15 | 1.00 | | | | | |
| 8. Avoidance (General) | 0.22* | 0.33* | 0.41* | 0.50* | 0.03 | -0.13 | 0.26* | 1.00 | | | | |
| 9. Meaning Making | 0.18* | 0.21* | 0.23* | 0.49* | 0.19 | -0.08 | 0.09 | 0.23* | 1.00 | | | |
| 10. Relational Words | 0.12* | -0.05 | -0.01 | -0.04 | 0.06 | -0.00 | -0.01 | -0.45* | -0.04 | 1.00 | | |
| 11. Non-Relational Words | -0.24* | -0.04 | -0.33* | -0.22* | -0.02 | -0.25 | -0.21* | 0.04 | -0.09 | -0.02 | 1.00 | |
| 12. "Social" Parent Words | -0.02 | 0.10 | 0.20* | 0.01 | -0.01 | 0.31 | 0.25* | -0.20* | -0.22* | 0.34* | -0.08 | 1.00 |
| <i>N</i> | 437 | 438 | 425 | 425 | 50 | 51 | 453 | 453 | 339 | 339 | 339 | 339 |
| <i>M</i> | 1.66 | 2.95 | 2.10 | 3.74 | 2.68 | 4.22 | 4.09 | 3.42 | 2.03 | 1.62 | 1.80 | 0.20 |
| <i>SD</i> | 1.27 | 1.78 | 1.62 | 1.88 | 1.82 | 1.56 | 1.76 | 1.33 | 0.76 | 1.65 | 1.60 | 0.52 |

Note: Means and SDs presented for raw attachment Avoidance and Anxiety scores, prior to mean centering.

* $p < .05$

R (R Core Team 2018). Prior to conducting analyses, continuous predictor variables (i.e., attachment anxiety and avoidance) were mean-centered.

Meaning Making. To test whether individual differences in attachment would be predictive of meaning-making in peoples' narratives, meaning making scores were regressed onto attachment anxiety and avoidance for each interpersonal target. There were no significant associations between individual differences in attachment and meaning making (see Table 2.) In summary, attachment styles were not associated with the extent to which DC adults derived meaning from their donor conception.

Table 2. Multiple Regression Models: Meaning Making (coded narratives)

| Variables | β | SE | R ² |
|----------------------|---------|------|----------------|
| Intercept | 2.03* | 0.04 | .00 |
| General Avoidance | 0.00 | 0.03 | |
| General Anxiety | -0.00 | 0.03 | |
| Intercept | 2.03* | 0.04 | .01 |
| Biological Avoidance | 0.02 | 0.03 | |
| Biological Anxiety | 0.02 | 0.04 | |
| Intercept | 2.04* | 0.04 | .01 |
| Social Avoidance | 0.04 | 0.03 | |
| Social Anxiety | -0.00 | 0.03 | |
| Intercept | 1.99* | 0.14 | .07 |
| Donor Avoidance | -0.10 | 0.09 | |
| Donor Anxiety | 0.12 | 0.08 | |

Note: * $p < .05$; The extent to which the narrator gleaned meaning from their donor conception experience: no meaning (1=low score), concrete lesson (2=moderate score), deep insight (3=high score).

Custom LIWC Variables. Each of our three custom LIWC variables (relational words, non-relational words, "social" parent words) were regressed onto attachment anxiety and avoidance by interpersonal target. Results indicated no significant associations between attachment style and relational words, nor attachment style and non-relational words (see Tables 3 and 4). However, a significant association was found for adults who were high in attachment avoidance and anxiety with respect to their close relationships in general (see Table 5). Specifically, people who were anxiously attached were more likely to endorse the term "social" parent.

People who were avoidant were less likely to use this terminology when writing about their donor conception experience.

Table 3. Multiple Regression Models: Relational words (LIWC)

| Variables | β | SE | R^2 |
|----------------------|---------|------|-------|
| Intercept | 1.62* | 0.09 | .00 |
| General Avoidance | -0.01 | 0.08 | |
| General Anxiety | -0.02 | 0.06 | |
| Intercept | 1.62* | 0.09 | .00 |
| Biological Avoidance | 0.07 | 0.06 | |
| Biological Anxiety | -0.05 | 0.09 | |
| Intercept | 1.63* | 0.09 | .01 |
| Social Avoidance | 0.09 | 0.06 | |
| Social Anxiety | -0.06 | 0.07 | |
| Intercept | 1.76* | 0.28 | .00 |
| Donor Avoidance | -0.03 | 0.19 | |
| Donor Anxiety | 0.06 | 0.16 | |

Note: * $p < .05$; A custom LIWC dictionary was created to analyze relational words (i.e., father, dad) that participants used to describe their donor conception experience.

Table 4. Multiple Regression Models: Non-relational words (LIWC)

| Variables | β | SE | R^2 |
|----------------------|---------|------|-------|
| Intercept | 1.79* | 0.09 | .01 |
| General Avoidance | -0.02 | 0.07 | |
| General Anxiety | -0.07 | 0.05 | |
| Intercept | 1.80* | 0.09 | .01 |
| Biological Avoidance | -0.03 | 0.06 | |
| Biological Anxiety | -0.07 | 0.09 | |
| Intercept | 1.78* | 0.09 | .01 |
| Social Avoidance | -0.04 | 0.06 | |
| Social Anxiety | -0.07 | 0.07 | |
| Intercept | 2.18* | 0.23 | .05 |
| Donor Avoidance | -0.23 | 0.16 | |
| Donor Anxiety | 0.03 | 0.13 | |

Note: * $p < .05$; A custom LIWC dictionary was created to analyze non-relational words (i.e., donor, sperm) that participants used to describe their donor conception experience.

Table 5. Multiple Regression Models: “Social” parent words (LIWC)

| Variables | β | SE | R ² |
|--------------------------|---------------|------|----------------|
| Intercept | 0.20* | 0.03 | .02 |
| General Avoidance | -0.05* | 0.02 | |
| General Anxiety | 0.04* | 0.02 | |
| Intercept | 0.20* | 0.03 | .00 |
| Biological Avoidance | 0.02 | 0.02 | |
| Biological Anxiety | -0.01 | 0.03 | |
| Intercept | 0.20* | 0.03 | .00 |
| Social Avoidance | 0.01 | 0.02 | |
| Social Anxiety | -0.00 | 0.02 | |
| Intercept | 0.20* | 0.03 | .00 |
| Donor Avoidance | 0.01 | 0.02 | |
| Donor Anxiety | -0.00 | 0.02 | |

Note: * $p < .05$; A custom LIWC dictionary was created to analyze words involving “social” parents that participants used to describe their donor conception experience.

Frequent Words. For exploratory purposes, we examined the most frequent words that participants used in their essays. This was done in an effort to better understand the extent to which people use specific words to describe their donor conception experience. Figure 1 is a visual representation of these words.

who were avoidant were less likely to use this terminology when writing about their donor conception experience. This result, combined with other exploratory findings (see supplemental materials), suggests that insecurely attached DC adults may construct their narrative identities differently than their secure counterparts.

The current findings imply that aspects of individuals' language use (i.e., use of the term "social" parent) may vary by attachment style. But what about language expressed *between* parents and their children? Research by Borelli and colleagues (2017) suggests that language style matching (LSM) between mothers and pre-adolescent children was associated with greater attachment security. Future work should examine the correspondence between DC adults' language use and that of their parents (biological, non-biological, donor). In a related vein, scholars might consider studying whether parent-child language matching predicts various outcomes in donor conception (e.g., curiosity, search/contact behavior). Another question that warrants investigation is whether language shapes attachment-related thoughts, or whether thoughts about one's attachment figure influences language. Future research should seek to clarify the directional nature of this relationship.

The current study is the first of its kind to investigate individual differences in attachment with respect to natural word use in a sample of donor-conceived adults. Despite this contribution, there are a few shortcomings of the present research. First and foremost, our findings are limited by the characteristics of our convenience sample; that is, participants were largely White females born via sperm donation, which affects the generalizability of our conclusions. However, it is important to note it is challenging, if not impossible, to recruit donor-conceived people without a database such as the Donor Sibling Registry (DSR). Added to this, is the inherent difficulty in comparing the characteristics of people in our sample to the population of donor-conceived people in the United States³. Second, while we asked people how they discovered their donor conception, we did not assess age at which adults learned about their donor conception. Previous research has shown that age can make a difference in how one feels in response to the discovery of their donor conception (Hertz et al. 2013). Third, we asked our participants to write about how the experience of donor conception has

³ It is unknown how many donor-conceived individuals are born each year in the United States although "30,000 to 60,000 annual births" has been incorrectly trotted out in academia, lectures, and the media (Kramer 2015). A few sources have attempted to enumerate the use of donated sperm but have focused on only a small subset of infertility services, such as IVF (Gerkowicz et al. 2018). New research has attempted to use weighted proportions and logistic regression for rare events to generate population estimates for donated sperm in the United States (Arocho, Lozano, & Halpern 2019).

influenced their life, how it came about, etc., but we did not ask them to describe specific experiences with each of their parents (biological, non-biological, donor). Perhaps this is why we didn't find that insecure attachment (by parental type) predicted use of the term "social" parent, although global attachment did. Future research should address these limitations.

Despite these flaws, our findings add to the growing literature on language use and attachment. Furthermore, these results hold real-world value as assisted reproductive technology has become an increasingly popular choice for couples who are infertile. For instance, a recent report states that the number of women using donated gametes (e.g., eggs) has risen sharply in the past 10 years (BBC News). At the same time, recent research suggests that mothers who have utilized egg donation may react less sensitively to their babies and have a lower confidence in their parenting ability (Imrie, Jadvá, Fishel & Golombok 2018). Despite these possibilities, very little research has focused on parent-child relationships in the context of donor conception. Our research takes the first step in addressing that gap.

REFERENCES

- Ainsworth, Mary D. Salter. 1973. The development of infant-mother attachment. In Cardwell, B. & Ricciuti, H. (eds.), *Review of child development research*, vol. 3, 1-94. Chicago: University of Chicago Press.
- Arocho, Rachel, Lozano, Elizabeth B., & Halpern, Carolyn. T. 2019. Using NSFG to estimate the number of families using donor sperm. *Fertility and Sterility* 4. 718-723. Doi 10.1016/j.fertnstert.2019.05.031
- Bartholomaeus, Clare & Riggs, Damien W. 2019. Embryo donation and receipt in Australia: views on the meanings of embryos and kinship relations. *New Genetics and Society* 38. 1-17.
- Baumeister, Roy. F. 1991. *Meanings in life*. New York, NY: Guilford.
- BBC News (2018, March 21). IVF egg donor use rises sharply, HFEA figures show. Retrieved from <https://www.bbc.com/news/uk-england-43458405>
- Beeson, Diana, Darnovsky, Marcy, & Lippman, Abby. 2015. What's in a name? Variations in terminology of third-party reproduction. *Reproductive biomedicine online* 31. 805-814.
- Beeson, Diana, Jennings, P. K., & Kramer, Wendy. 2011. Offspring searching for their sperm donors: how family type shapes the process. *Human reproduction* 26. 2415-2424.

- Borelli, Jessica L., David, Daryn H., Rifkin-Graboi, Anne, Sbarra, David A., Mehl, Matthias R., & Mayes, Linda, C. 2013. Language use in the Adult Attachment Interview: Evidence for attachment-specific emotion regulation. *Personal Relationships* 20. 23–37. Doi: 10.1111/j.1475-6811.2012.01394.x
- Borelli, Jessica L., Ramsook, Kizzann. A., Smiley, Patricia, Kyle-Bond, David, West, Jessica L. & Buttitta, Katherine H. 2017. Language matching among mother-child dyads: Associations with child attachment and emotion reactivity. *Social Development* 26. 610-629. Doi: 10.1111/sode.12200
- Borelli, Jessica L., Sbarra, David A., Mehl, Matthias, & David, Daryn H. 2011. Experiential connectedness in children's attachment interviews: An examination of natural word use. *Personal Relationships* 18. 341-351. Doi: 10.1111/j.1475-6811.2010.01294.x
- Bowlby, John. 1969. *Attachment and loss: Vol. 1. Attachment*. New York: Basic Books.
- Bowlby, John. 1973. *Attachment and loss: Vol. 2. Separation: Anxiety and anger*. New York: Basic Books.
- Brennan, Kelly A., Clark, Catherine L., & Shaver, Phillip R. 1998. Self-report measurement of adult romantic attachment: An integrative overview. In J. A. Simpson & W. S. Rholes (eds.), *Attachment theory and close relationships* (pp. 46-76). New York: Guilford Press.
- Cammu, Nola 2017. How should we name the parents? The challenges of plus-two-parent families for legal kinship terminology. *International Journal of Law, Policy and the Family* 31. 328-343.
- Ehrensaft, Diana 2008. When baby makes three or four or more: Attachment, individuation, and identity in assisted-conception families. *The psychoanalytic Study of the Child* 63. 3-23.
- Fraley, R. Chris, Heffernan, Marie E., Vicary, Amanda M., & Brumbaugh, Claudia Chloe 2011. The Experiences in Close Relationships–Relationship Structures Questionnaire: A method for assessing attachment orientations across relationships. *Psychological Assessment* 23. 615–625. Doi: 10.1037/a0022898
- Freeman, Tabitha, Bourne, Kate, Jadv, Vasanti, & Smith, Venessa 2014. Making connections: contact between sperm donor relations. *Relatedness in assisted reproduction*. 270-295.
- Gerkowicz, Sabrina A., Crawford, Sara B., Hipp, Heather S., Boulet, Sheree L., Kissin, Dmitry M., & Kawwass, Jennifer F. 2018. Assisted reproductive technology with donor sperm: National trends and perinatal outcomes. *American Journal of Obstetrics and Gynecology* 218. 421.e421-421.e410. Doi: 10.1016/j.ajog.2017.12.224
- Hertz, Rosanna, Nelson, Margaret K., & Kramer, Wendy 2013. Donor conceived offspring conceive of the donor: The relevance of age, awareness, and family form. *Social Science & Medicine* 86. 52-65.

- Indekeu, Astrid 2015. Parent's expectations and experiences of resemblance through donor conception. *New Genetics and Society* 34. 398-416.
- Imrie, Susan, Jadv, Vasanti, Fishel, Simon, & Golombok, Susan. 2018. Families created by egg donation: parent-child relationship quality in infancy. *Child Development*, Doi: 10.1111/cdev.13124
- Kramer, Wendy. (2015, October 6). 30k-60k US sperm and egg donor births per year? *Huffington Post*. Retrieved from https://www.huffingtonpost.com/wendy-kramer/a-call-to-to-stop-using-t_b_8126736.html
- Lozano, Elizabeth B., Fraley, R. Chris, & Kramer, Wendy. 2019. Attachment in donor conception: Curiosity, search, and contact. *Personal Relationships* 26. 331– 344. Doi: 10.1111/pere.12273
- Mac Dougall, Kristin, Becker, Gay, Scheib, Joanna E., & Nachtigall, Robert D. 2007. Strategies for disclosure: how parents approach telling their children that they were conceived with donor gametes. *Fertility and sterility* 87. 524-533.
- McAdams, Dan P., & McLean, Kate C. (2013). Narrative Identity. *Current Directions in Psychological Science* 22. 233-238. Doi: 10.1177/0963721413475622
- Mehl, Matthias R. 2006. Quantitative Text Analysis. In M. Eid & E. Diener (Eds.), *Handbook of multimethod measurement in psychology* (pp. 141-156). Doi: 10.1037/11383-011
- Pennebaker, James W., Booth, Roger J., Boyd, Ryan L. & Francis, Martha E. 2015a. Linguistic Inquiry and Word Count: LIWC2015 Operator's Manual. https://s3-us-west2.amazonaws.com/downloads.liwc.net/LIWC2015_OperatorManual.pdf
- Pennebaker, James W., Boyd, Ryan L., Jordan, Kayla, & Blackburn, Kate 2015b. *The development and psychometric properties of LIWC2015*. Austin, TX: University of Texas at Austin.
- Pennebaker, James W., Mehl, M. R., & Niederhoffer, K. G. 2003. Psychological aspects of natural language use: Our words, our selves. *Annual review of psychology* 54. 547-577.
- Pennebaker, James W., & King, Laura A. 1999. Linguistic styles: Language use as an individual difference. *Journal of Personality and Social Psychology* 77. 1296–1312. Doi: 10.1037/0022-3514.77.6.1296
- Provoost, Veerle, Bernaerdt, Jodie, Van Parys, Hanna, Buysse, Ann, De Sutter, Petra, & Pennings, Guido. 2017. 'No daddy', 'A kind of daddy': words used by donor conceived children and (aspiring) parents to refer to the sperm donor. *Culture, health & sexuality* 20. 381-396.
- R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>.

- Rosseel, Yves. 2012. lavaan: An R package for structural equation modeling. *Journal of Statistical Software* 48. 1-36.
- Schwartz, Jonathan P., Lindley, Lori D., & Buboltz Jr, Walter C. 2007. Adult attachment orientations: Relation to affiliation motivation. *Counselling Psychology Quarterly* 20. 253-265.
- Tausczik, Yia R., & Pennebaker, James W. 2010. The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology* 29. 24-54. Doi: 10.1177/0261927X09351676
- Wyverkens, E., Provoost, V., Ravelingien, A., De Sutter, P., Pennings, G., & Buysse, A. 2014. Beyond sperm cells: a qualitative study on constructed meanings of the sperm donor in lesbian families. *Human Reproduction* 29. 1248-1254.

APPENDIX: SUPPLEMENTAL MATERIALS

1.1. Pre-registered Analyses

Verbal Immediacy. Verbal immediacy was computed based on the standardized LIWC categories first-person singular, discrepancy words, present tense verbs and inverse scores for articles and words of more than six letters (Borelli et al., 2011, 2013; Pennebaker & King, 1999). Cronbach's alpha for immediacy in this sample was .51.

Affiliation. Unlike verbal immediacy which requires computing an aggregated score, affiliation is a single category that is automatically produced by LIWC. Based on McClelland's (1985) need for affiliation (nAff), the construct represents a person's need to feel a sense of involvement and "belonging" within a group. Those who are high in need for affiliation are thought to possess a greater desire for harmonious relationships and also prefer social interaction.

1.2. Results

Verbal Immediacy. We ran a series of multiple regressions to test the first hypothesis that individual differences in attachment would predict verbal immediacy in DC adults' self-narratives. The dependent variable, verbal immediacy, was regressed onto attachment anxiety and avoidance for each interpersonal target (e.g., biological parent, non-biological parent). As Table 6 illustrates, there were no statistically significant associations between individual differences in attachment and verbal immediacy scores.

Table 6. Multiple Regression Models: Verbal Immediacy (LIWC)

| Variables | β | SE | R ² |
|----------------------|---------|------|----------------|
| Intercept | 0.01 | 0.03 | .02 |
| General Avoidance | 0.04 | 0.03 | |
| General Anxiety | 0.03 | 0.02 | |
| Intercept | 0.00 | 0.03 | .00 |
| Biological Avoidance | 0.01 | 0.02 | |
| Biological Anxiety | -0.01 | 0.03 | |
| Intercept | -0.01 | 0.03 | .01 |
| Social Avoidance | 0.00 | 0.02 | |
| Social Anxiety | -0.04 | 0.03 | |
| Intercept | -0.08 | 0.06 | .05 |
| Donor Avoidance | 0.06 | 0.04 | |
| Donor Anxiety | -0.02 | 0.04 | |

Note: * $p < .05$; Language low in verbal immediacy can be described as psychologically distant and detached, while language high in verbal immediacy may indicate over-involvement with one's feelings and thoughts.

Affiliation. To assess whether anxious adults exhibited a greater affiliative intent than their less anxious counterparts, we conducted multiple regression models with anxiety and avoidance predicting affiliation, as measured by LIWC2015 (see Table 7). Contrary to our hypothesis, adults who were high in attachment anxiety with respect to their non-biological, “social” parent used *less* affiliative language in their self-narratives: $\beta = -.24$, $SE = .11$, $p = .034$, 95% CIs [-0.45, -0.02]. This finding suggests that people who are anxiously attached to their non-genetic parent have a lower sense of “belonging” when it comes to their donor conception. Unlike people characterized by high affiliation motivation, anxious adults may have conflictual relationships and might not initiate interpersonal interactions (i.e., social contact) at times. As age and gender impact word use (Pennebaker & Stone, 2003), we included these demographics as covariates in our analysis. After controlling for age and gender, this association was still significant, $\beta = -.25$, $SE = .11$, $p = .024$, 95% CIs [-0.47, -0.03].

Table 7. Multiple Regression Models: Affiliation (LIWC)

| Variables | β | SE | R ² |
|-----------------------|---------------|------|----------------|
| Intercept | 4.02* | 0.14 | .01 |
| General Avoidance | -0.15 | 0.11 | |
| General Anxiety | -0.04 | 0.09 | |
| Intercept | 4.02* | 0.14 | .00 |
| Biological Avoidance | -0.01 | 0.10 | |
| Biological Anxiety | -0.08 | 0.15 | |
| Intercept | 4.04* | 0.14 | .01 |
| Social Avoidance | 0.10 | 0.09 | |
| Social Anxiety | -0.24* | 0.11 | |
| Intercept | 4.57* | 0.52 | .08 |
| Donor Avoidance | 0.42 | 0.36 | |
| Donor Anxiety | -0.49 | 0.29 | |

Note: * $p < .05$

1.3. Non-registered Analyses

Exploratory LIWC variables. In addition to the aforementioned language dimensions, we obtained four summary variables (Analytic Thinking, Clout, Authenticity, Emotional Tone) that are standard LIWC categories produced with any output. According to Pennebaker and colleagues (2015b) each of these variables have been re-scaled to produce a 100-point scale ranging from 0 to 100. For more information on these variables, consult the LIWC2015 operator manual (2015b, pgs. 21-22).

1.4. Results

Exploratory LIWC Variables. We performed a set of exploratory analyses with the four LIWC summary language variables (Analytic Thinking, Clout, Authenticity, Emotional Tone). Each of these variables was regressed onto attachment anxiety and avoidance for each interpersonal target. Results indicated no significant associations between individual differences in attachment and Analytic Thinking. However, significant associations emerged for Clout, Authenticity, and Emotional Tone. Please see Tables 8-11 for more information.

Table 8. Multiple Regression Models: Analytic Thinking (LIWC)

| Variables | <i>B</i> | <i>SE</i> | <i>R</i> ² |
|----------------------|----------|-----------|-----------------------|
| Intercept | 26.52* | 1.07 | .00 |
| General Avoidance | -0.79 | 0.90 | |
| General Anxiety | 0.56 | 0.67 | |
| Intercept | 26.51* | 1.09 | .00 |
| Biological Avoidance | -0.39 | 0.77 | |
| Biological Anxiety | 0.62 | 1.14 | |
| Intercept | 26.79* | 1.10 | .00 |
| Social Avoidance | 0.12 | 0.73 | |
| Social Anxiety | 0.82 | 0.87 | |
| Intercept | 28.02* | 3.43 | .02 |
| Donor Avoidance | -1.44 | 2.38 | |
| Donor Anxiety | 1.46 | 1.92 | |

Note: * $p < .05$; According to Pennebaker et al. (2015a), this summary variable has been re-scaled so that it reflects a 100-point scale ranging from 0 to 100. A high number reflects formal, logical, and hierarchical thinking; lower numbers reflect more informal, personal, here-and-now, and narrative thinking.

Table 9. Multiple Regression Models: Clout (LIWC)

| Variables | <i>B</i> | <i>SE</i> | <i>R</i> ² |
|--------------------------|---------------|-----------|-----------------------|
| Intercept | 29.42* | 1.11 | .02 |
| General Avoidance | -2.52* | 0.93 | |
| General Anxiety | 0.95 | 0.70 | |
| Intercept | 29.41* | 1.12 | .01 |
| Biological Avoidance | 0.32 | 0.79 | |
| Biological Anxiety | 1.51 | 1.18 | |
| Intercept | 29.89* | 1.15 | .01 |
| Social Avoidance | 0.60 | 0.77 | |
| Social Anxiety | 0.45 | 0.91 | |
| Intercept | 33.10* | 3.01 | .02 |
| Donor Avoidance | 0.35 | 2.09 | |
| Donor Anxiety | -1.38 | 1.68 | |

Note: * $p < .05$; According to Pennebaker et al. (2015a), this summary variable has been re-scaled so that it reflects a 100-point scale ranging from 0 to 100. A high number suggests that the author is speaking from the perspective of high expertise and is confident; low numbers suggest a more tentative, humble, even anxious style.

Table 10. Multiple Regression Models: Authenticity (LIWC)

| Variables | <i>B</i> | <i>SE</i> | <i>R</i> ² |
|---------------------------|---------------|-----------|-----------------------|
| Intercept | 83.91* | 1.05 | .00 |
| General Avoidance | 0.28 | 0.88 | |
| General Anxiety | -0.25 | 0.66 | |
| Intercept | 83.87* | 1.04 | .03 |
| Biological Avoidance | 0.02 | 0.74 | |
| Biological Anxiety | -2.71* | 1.09 | |
| Intercept | 83.80* | 1.07 | .01 |
| Social Avoidance | -0.67 | 0.72 | |
| Social Anxiety | -0.28 | 0.85 | |
| Intercept | 81.40* | 3.42 | .06 |
| Donor Avoidance | -3.46 | 2.37 | |
| Donor Anxiety | 1.35 | 1.91 | |

Note: * $p < .05$; According to Pennebaker et al. (2015a), this summary variable has been re-scaled so that it reflects a 100-point scale ranging from 0 to 100. Higher numbers are associated with a more honest, personal, and disclosing text; lower numbers suggest a more guarded, distanced form of discourse.

Table 11. Multiple Regression Models: Emotional Tone (LIWC)

| Variables | β | SE | R^2 |
|-----------------------------|---------------|------|-------|
| Intercept | 46.88* | 1.58 | .07 |
| General Avoidance | 0.50 | 1.32 | |
| General Anxiety | -4.70* | 0.99 | |
| Intercept | 47.02* | 1.59 | .07 |
| Biological Avoidance | -2.63* | 1.12 | |
| Biological Anxiety | -3.61* | 1.67 | |
| Intercept | 46.61* | 1.64 | .02 |
| Social Avoidance | -1.49 | 1.10 | |
| Social Anxiety | -1.46 | 1.31 | |
| Intercept | 51.53* | 4.94 | .16 |
| Donor Avoidance | -4.80 | 3.43 | |
| Donor Anxiety | -4.63 | 2.76 | |

Note: * $p < .05$; According to Pennebaker et al. (2015a), this summary variable has been re-scaled so that it reflects a 100-point scale ranging from 0 to 100. A high number is associated with a more positive, upbeat style; a low number reveals greater anxiety, sadness, or hostility. A number around 50 suggests either a lack of emotionality or different levels of ambivalence.