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Determining women's sexual self-schemas through advanced computerized text analysis☆

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ABSTRACT

The meaning extraction method (MEM), an advanced computerized text analysis technique, was used to analyze women's sexual self-schemas. Participants ($n = 239$) completed open-ended essays about their personal feelings associated with sex and sexuality. These essays were analyzed using the MEM, a procedure designed to extract common themes from natural language. Using the MEM procedure, we extracted seven unique themes germane to sexual self-schemas: family and development, virginity, abuse, relationship, sexual activity, attraction, and existentialism. Each of these themes is comprised of frequently used words across the participants' descriptions of their sexual selves. Significant differences in sexual self-schemas were observed to covary with age, relationship status, and sexual abuse history.

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Introduction

Recently, researchers have developed new methods of text analysis that allow themes to be extracted from natural language. These methods, known as *topic modeling*, have been used to better understand psychological variables, such as alcohol-related behavior (Lowe et al., 2013), the transition from in-patient care to outpatient care (Wolf, Chung, & Kordy, 2010), and personality (Schwartz, Eichstaedt, Dziurzynski, et al., 2013). Unlike traditional self-report measures, topic modeling methods are able to capture and quantify concepts of interest based upon what people express in their own words, allowing free response data to be uniformly quantified in an inductive fashion. Topic modeling methods are also non-invasive, which is beneficial for the analysis of sensitive topics such as sexuality, particularly in the context of childhood sexual abuse. This approach has not yet been used to explore the content and structure of individual sexual self-schemas. In the current research, we propose that the use of methods designed to capitalize on natural language may allow us to better understand the content of sexual self-schemas as well as the relationship between sexual self-schemas and factors like age, relationship status, and abuse history.

Language is a unique reflection of underlying cognitive processes, such as self-schema. Derived from specific past events and experiences, self-schemas are cognitive generalizations about the self that guide self-evaluation of one's behavior (Markus, 1977). Self-schemas affect the way in which people perceive and process self-relevant information. They have been shown to both facilitate *and* hinder accurate and efficient information processing (e.g., Kihlstrom & Nasby, 1981), as

they act as a lens through which people view the world and thus serve as a potential mechanism of interpretational bias (Dodge & Tomlin, 1987). Self-schemas are believed to develop around social experiences in infancy and childhood (e.g., Bowlby, 1969, 1973, 1980), and generally remain consistent throughout the lifespan (Mikulincer, 1995). As individuals accumulate repeated experiences, their self-schemas become increasingly embedded and therefore increasingly resistant to change (Markus, 1990). Indeed, frequently activated self-schema may become chronically accessible over time, affecting thoughts, feelings, and behavior (Bargh & Tota, 1988).

Extending the self-schema concept to the field of sex research, Andersen and Cyranowski introduced the construct of *sexual self-schemas* in 1994. Based on their hypothesis that women differ in cognitive representations of their sexual selves, Andersen and Cyranowski (1994) defined sexual self-schemas as cognitive generalizations about sexual aspects of the self that both influence the processing of sexually relevant information and guide sexual behavior. They also posited that the valence of sexual self-schemas affects behavior in intimate relationships and as well as overall sexual function.

Researchers have since examined sexual self-schemas using two broad assessment methodologies: extrinsic and intrinsic. Extrinsic methods, like self-report questionnaires, are common in the social sciences because they offer discrete, experimenter-generated items that are relatively easy to score and inexpensive to administer. Originally, Andersen and Cyranowski (1994) adopted a largely extrinsic approach to assessing sexual self-schemas in the development of the Sexual Self Schema Scale. To do so, they created a 50-item scale of trait adjectives (26 scored and 24 fillers), from which they extracted three aspects of women's sexual self-schemas, two positive and one negative. The two positive aspects were defined as passion/romance and openness to sexual experience, and the negative aspect is defined as embarrassment/conservatism. The researchers concluded that the Sexual Self Schema Scale established a true semantic representation of the "sexual woman". However, this approach does not provide a holistic assessment of the sexual-self schema construct. By relying solely on self-report, the researchers may have unintentionally imposed their ideas on participants, thus potentially failing to reflect the true nature of the participants' sexual self-schemata.

The Sexual Self Schema Scale has been used to examine the effect of past sexual abuse on sexual self-schemas. Reissing, Binik, Khalifé, Cohen, and Amsel (2003) found that women with past sexual abuse had significantly less positive sexual self-schemas compared to women who were not abused. Echoing this, Meston, Rellini, and Heiman (2006) found that childhood sexual abuse (CSA) survivors were more likely to view themselves as less passionate/romantic during sexual arousal than women who had no history of childhood sexual abuse (NSA). In the studies described above, sexual self-schemas were only assessed with the self-report Sexual Self Schema Scale.

Comparatively little research has applied intrinsic rather than extrinsic methods to assess sexual self-schemas in women. Intrinsic methods in sex research are less direct than self-report measures and often involve tests of reaction times (Mouras et al., 2003), implicit associations (Meston & Heiman, 2000), physiological responses (Meston & Gorzalka, 1996a, 1996b) as well as general unconditioned responses, like cortisol levels (Meston & Lorenz, 2013). A few studies in this field have used the Linguistic Inquiry and Word Count Software (LIWC; Pennebaker, Booth, & Francis, 2001) to analyze themes within bodies of text (Lorenz & Meston, 2012; Pulverman, Lorenz, & Meston, 2015). The LIWC program operates by tallying the frequencies of words that fall within discrete, experimenter-defined categories. Yet, we could only identify one study that applied entirely implicit methods to assess the ways in which women categorize information about their sexual selves. In this study, Meston and Heiman (2000) used an implicit card-sort task to examine differences between women with past sexual abuse histories and non-abused women in their categorization of sexually relevant self-information. They found that sexually abused women attributed different meanings to many sexually relevant concepts than did their non-abused counterparts.

While both intrinsic and extrinsic assessment methods provide unique and valuable information about women's sexual self-schemas, each method alone offers an incomplete picture of this multifaceted construct. When participants complete self-report questionnaires, they react to pre-determined anchors and their responses can be affected by factors such as general response biases (Austin et al., 1998), skewed self-theories (Swann, Chang-Schneider, & Larsen McClarty, 2007), and cultural factors (Hamamura, Heine, & Paulhus, 2008).

We suggest that by employing a method that combines the benefits of intrinsic and extrinsic approaches, it may be possible to create a more complete and dynamic understanding of sexual self-schemas than either method in isolation. Intrinsic methods of assessment may be an attractive alternative to traditional self-report measures, as they offer participants the opportunity to describe themselves in their own words. In doing so, participants record self-descriptions using words that are particularly salient and accessible to them (Ramirez-Esparza, Chung, Sierra-Otero, & Pennebaker, 2011). However, while intrinsic approaches can offer more participant-specific assessment of self-schemas, the use of these methods alone can produce large amounts of data that are unwieldy and difficult to quantify, thus invoking the need for labor-intensive qualitative coding (see Krippendorff, 2012). Recent advances in natural language processing have rendered many of these obstacles obsolete, as language quantification tools have become increasingly available for little to no cost. These advances have enabled us to take a traditionally intrinsic method, such as free-response self-reports, and create objective measurement scores akin to those typically found in extrinsic methodologies.

Traditional automated text analysis tools that are often used to analyze large bodies of text often fail to account for the nuances of meaning in written expression. These tools tallied the use of words belonging to predefined categories, such as socially relevant words or words related to emotions. For example, the LIWC software (Pennebaker et al., 2001) analyzes text by calculating the percentages of words that belong to more than 40 scientist-defined categories; this approach has become the most prominent in the social sciences (Schwartz, Eichstaedt, Kern, et al., 2013). A downside of the LIWC approach is

that, like traditional self-report measures, it relies solely on preconceived concepts. Also, LIWC is unable to determine the semantic context of a given word, the novel or unexpected themes present in a text, and other nuances of word use. For example, according to the LIWC methodology, the word "connect" will be treated purely in physical terms (i.e. a bridge "connects" two cities). However, in the context of women discussing their feelings about relationships and sexuality, the word "connect" can take on a very different, more psychological meaning. The LIWC program would be unable to statistically derive the semantic context of the word "connect" in our sample.

The Meaning Extraction Method (MEM; Chung & Pennebaker, 2008), a relatively new method of text analysis, incorporates both extrinsic and intrinsic methods in a single analysis. Like traditional word-counting approaches, the MEM procedure assumes that words with similar meanings and underlying themes tend to cluster together in a large group of texts, and that these co-occurrences are psychologically meaningful. For example, people who are depressed tend to use more depression-relevant words (De Choudhury, Gamon, Counts, & Horvitz, 2013). Each cluster of words identified by the MEM procedure can be thought of as a core component or theme of individual self-evaluation. The strength of the MEM lies in its ability to combine the wide sampling power of quantitative data with the rich detail and nuance of qualitative data.

Chung and Pennebaker (2008) originally developed the MEM using 1165 open-ended self-descriptions written by college students. The experimenters asked participants to complete self-descriptive essays, enabling them to describe themselves in their own words. After identifying the most commonly used adjectives in these descriptions, the authors conducted a factor analysis of the adjectives, producing a 7-factor solution of psychologically meaningful dimensions of personality. In the MEM, the participants, rather than the experimenters, were the ones to define the words that comprised each of the seven factors. By identifying similarities among participants in the combinations of words they use to describe themselves, the experimenters identified the common ways that people think about themselves. Therefore, this method lends itself well to the study of self-schemas. With the MEM, themes in a given body of text can be quantified and examined across different demographic groups, clinical populations, and time periods to assess for differences and potential changes in self-schemas.

The MEM has since been used with different types of text to extract latent components or themes with very limited induction or bias. Wolf et al. (2010) applied the MEM to over 4,000 emails written by outpatients to their therapists in the weeks following inpatient treatment for depression. The MEM was able to successfully derive themes that outpatients most commonly discussed with their therapists, including family, work, social interactions, and lingering symptoms. The authors of this study also found that patients who had improved *least* during treatment continued to focus on symptoms post-treatment, while patients who improved during their inpatient treatment were less likely to write about their symptoms once they returned home. Ramirez-Esparza et al. (2011) used the MEM to compare self-schemas between Mexicans and Americans, finding that certain self-schemas were common across cultures while others were culture-specific. The MEM appears to be an effective tool with which to examine various types of text to uncover participant generated themes and ideas.

Building upon these past applications of the MEM, we applied this language quantification procedure to essays written by women pertaining to their personal sexual self-schemas. The aim of the present study was two-fold. First, we proposed the MEM as an alternative method of analyzing sexual self-schema data. Second, we explored potential differences between the extracted themes of the sexual self-schemas and participants' age, relationship status, and sexual abuse history. We hypothesized that women's sexual self-schemas would differ by individual differences factors including age group and relationship status, as sexual self-schemas are likely to change based on sexual experiences. Regarding abuse status, research using Andersen and Cyranowski's Sexual Self Schema Scale (1994) has shown that women with a history of sexual abuse have significantly less positive sexual self-schemas compared to non-abused women (Reissing et al., 2003). Therefore, we hypothesized that women with a history of sexual abuse would possess sexual self-schemas that invoke more themes that may be considered less positive in qualitative terms than those of women who reported no abuse.

Method

Participants

Participants were recruited from the community via flyers, online advertisements, and print advertisements for a treatment study aimed to decrease symptoms of PTSD, depression, and sexual dysfunction in women who had experienced CSA. The essays analyzed in the present study were part of the intake session of a larger treatment outcome study (Meston, Lorenz, & Stephenson, 2013), and several other papers have analyzed data from this treatment study (Pulverman et al., 2015; Stephenson, Pulverman, & Meston, 2014). Women interested in participating were instructed to call the lab for more information and eligibility screening. Eligibility criteria included: (i) minimum of 18 years of age, (ii) no history of childhood sexual abuse *or* at least one unwanted sexual experience, defined as forced "oral, anal, or vaginal intercourse, penetration of the vagina or anus using objects or digits, or genital touching or fondling" *before* age 16 and *at least* 2 years prior to enrollment, (iii) currently being sexually active or in a potentially sexual relationship, and (iv) currently experiencing sexual dysfunction, distress, or low sexual satisfaction. The exclusion criteria were as follows: (i) a history of a traumatic event in the previous 3 months, (ii) a history of sexual abuse within the past 2 years, (iii) any diagnosis of bipolar disorder or psychosis in the previous 6 months, (iv) current homicidal or suicidal intent, (v) current psychotherapy for sexual or abuse-related issues, (vi) current use of illicit drugs, and (vii) current involvement in an abusive relationship. Once eligibility was determined, participants were invited to the lab for an intake session with an assessor. The procedures of this study were approved by

Table 1
Participant characteristics (N = 239).

	M	SD
Age (years)	33.5	10.9

	n	%
Race		
Caucasian	157	65.7
African American/Black	24	10.0
Native American/American Indian	12	5.0
Hispanic/Latina	36	15.1
Asian American	12	5.0
Other/missing	15	6.7
Highest level of education completed		
Some high school	5	2.1
High school diploma	28	11.7
Some college/undergraduate degree	169	70.7
Advanced degree	31	13.0
Other/missing	6	2.5
Level of relationship commitment		
Single, not dating	46	19.2
Single, dating	42	17.6
In a committed relationship	89	37.2
Married	52	21.8
Other/missing	10	4.2
Sexual abuse history		
No history of childhood sexual abuse (NSA)	101	42.3
History of childhood sexual abuse (CSA)	138	57.7

*Sexual orientation was assessed, but the base rate of non-heterosexuals was negligible.

the Institutional Review Board of the University of Texas at Austin from 2004 to 2013 and registered on ClinicalTrials.gov (identifier NCT01803802).

A final sample of 239 women, aged 18–64, participated in the study. The mean age of the sample was 33.5 (SD = 10.9). The sample included 138 women with a history of childhood sexual abuse (57.7%) and 101 non-abused women (42.3%). There was no significant difference in age between women with and without a history of CSA. There was a significant difference in commitment level between the two groups (Welsh's t = 3.32, p = .001). There was a higher level of relationship commitment in the abused group (M = 2.91, SD = 1.09) than in the non-abused group (M = 1.92, SD = 1.43). However, because this study examined relationships between sexual self-schema factors and different demographic factors, we did not control for demographics in our analyses. Other demographic information is presented in Table 1.

Procedure

The single study session included an expressive writing task and self-report questionnaires, and participants were each tested individually. The administrator oriented the participants to the study procedures and offered other relevant study information. After providing informed consent, each participant was asked to use a lab computer to write a brief essay about the sexual self. Participants were left alone and asked to write continuously in response to a prompt for 30 min. The prompt was as follows:

> *For the next 30 minutes, I would like you to write about your personal thoughts and feelings associated with sex and sexuality. In your writing, I'd like you to link your thoughts about sex to past, current, or future sexual experiences or relationships. You might also address more broadly how you view yourself as a sexual person. Please try to be as detailed as possible in your description. I'd like you to really let go and explore your very deepest emotions and thoughts.*

Participants were informed that their responses were completely confidential and that no one would read their writing until the study was completed. They were asked to save and close their document before the assessor returned. Participants were compensated monetarily for their time.

Language Analysis

To examine participants' sexual self-schemas, the MEM was applied to the essays written in response to the prompt. Broadly speaking, the MEM consists of three primary steps of analysis. First, the entire corpus of text is analyzed to determine word prominence, both within and across observations. A subsidiary part of this first step is the automatic conversion of words to their basic inflections, a process called lemmatization (e.g., "running", "ran", and "runs" are converted to "run"). Although there is no perfect automated lemmatization method, the large majority of the words in our sample were successfully reduced to their most basic inflections. In addition, common closed-class (i.e. "function") words and uncommon

open-class (i.e. "content") words are discarded as a way to ensure reliable estimates of language use (Chung & Pennebaker, 2008). Content words were considered common if they appeared in more than 7.5% of all observations. This percentage was chosen because it was halfway between the originally recommended 5–10% for determining the commonality of words (see Chung & Pennebaker, 2008). Second, all observations are given a binary (1 = present, 0 = absent) score for each of the remaining common content words. For example, if half of the participants use the word "love" when describing their sexual self-schemas, they would receive a "1" for this word, whereas the remaining participants would receive a "0". This is then carried out for all words that are used by a set minimum of participants, usually at least 5%. Finally, these scores are submitted to a Principle Components Analysis (PCA), which reveals clusters of commonly co-occurring words that constitute "themes".

Recently, Boyd (2014) has released free software designed to assist social scientists with topic modeling procedures, particularly with the MEM. The Meaning Extraction Helper (MEH) automates the first two stages of analysis by generating a list of common words with their respective frequencies and a PCA-ready dataset consisting of word use scores for each text. For the current analyses, we used the MEH software to process all writings by all the participants together, as well as separately for the CSA and non-sexually abused (NSA) groups.

Theme Extraction

To extract common themes from the participants' sexual self-schemas, we performed a PCA with varimax rotation on the binary word scores generated by the MEH for all participants. The diagnostic Bartlett's Sphericity Test (chi-squared = infinity) and the Kaiser–Meyer–Olkin metric (KMO = .32) indicated that a factor-type model was an acceptable fit for the data. The factors selected for inclusion had Eigenvalues above 4.40 and provided a significant increase to the cumulative percent variance accounted for by the model. Words with factor loadings of .25 or higher were retained, contributing to the identified theme. In total, the seven chosen factors accounted for 13.25% of the total variance. (Although this percentage may be considered small in the context of traditional factor analysis, that is not the case for principle components analyses of open-ended essays or unstructured natural language data. Given that ideas can be expressed using multiple different words, words that may change based on socioeconomic or cultural factors, it is not unusual for the MEM to account for smaller proportions of variance. Other studies using the MEM have reported similar percentages [e.g. Chung & Pennebaker, 2008; Wolf et al., 2010]).

Using standard MEM procedures, we decided that a solution consisting of seven themes was the most appropriate given the data. The MEM-derived word clusters corresponded to seven distinct themes: family and development, virginity, abuse, relationship, sexual activity, attraction, and existentialism (see Table 5). A considerable asset of the MEM and the MEH is that, following the extraction of themes, each theme can be quantified within each essay using a standard word-counting approach. Each essay was scored for each theme using word-counting software (Boyd, 2014) by counting up the total number of theme-relevant words for each essay, then dividing that number by the total word count. Here is a sample response to the sexual self-schema prompt:

> *I think of my self as a person who likes to have sex but usually when I am comfortable with a person. That goes with all aspects of my life. I was a pretty reserved teenager who heard of sex happening to others around me, such as friends and family. . . I didn't have sex until I was 18. I had boyfriends at that time. I was maybe a little promiscuous in college probably due to my curiosity. I was on birth control during that time. When I moved back to my father's house I abstained from sex because I wanted to concentrate on working. I ended up meeting my boyfriend with whom I've had the longest relationship in my life, three years! When we met, we both told each other that we haven't been with anyone for almost a year. . .But we found each other.*

This participant's sexual self-schema scored highest on the virginity theme (5.74) and on the relationship theme (3.39). Scores were also calculated for the other five themes, resulting in seven scores that can be thought of as the prominence of different sexual self-schema dimensions. Given that a PCA is a core part of the MEM, it is also possible to achieve negative scores for some themes, as some words are predictive of *decreased* theme prominence. Therefore, each individual essay can theoretically range from −100 to +100 for each theme. It is these quantified theme scores that we used for all subsequent analyses.

To ensure that participants did, in fact, respond to the assigned prompt, the texts were scanned for sex-relevant themes. To do so, we focused on the three most salient themes extracted from the overall sample. Because all participants wrote on each of these three themes, it was determined that they did respond to the prompt provided to them.

Results

The participant sample used in the current study was a non-random sample. As such, it is inappropriate to rely on traditional inferential statistics, because they, by nature, require a random sample of the population. However, inferential statistical methods are often helpful for understanding patterns of differences. Therefore, we chose to present means and correlation coefficients, without probability distributions, to highlight patterns within the data and to underscore important differences.

Table 2
Participant characteristics by sexual abuse group.

NSA			CSA		
	M	*SD*		*M*	*SD*
Age (years)			Age (years)		
	34.10	10.49		32.62	11.45
	n	*%*		*n*	*%*
Level of relationship commitment[a]			Level of relationship commitment		
Single, not dating	23	22.8	Single, not dating	23	16.7
Single, dating	12	11.9	Single, dating	30	21.8
In a committed relationship	55	54.5	In a committed relationship	34	24.6
Married	39	38.6	Married	13	9.4
Other/missing	4	4.0	Other/missing	6	4.3

[*] Sexual orientation was assessed, but the base rate of non-heterosexuals was negative.

[a] There is a significant difference between the two groups.

Table 3
Most frequently used words in sexual self-schemas.

	Word	Frequency (*n*)	% in texts
1	Sex	2026	97.91
2	Feel	1292	94.14
3	Time	697	91.63
4	Know	640	82.85
5	Sexual	621	83.26
6	Relationship	471	71.55
7	Year	439	71.55
8	Love	419	62.76
9	Man	408	61.92
10	Thing	348	63.60
11	Make	338	64.85
12	Guy	287	46.86
13	People	277	52.72
14	Try	270	59.41
15	Person	262	60.25
16	Friend	260	46.03
17	Thought	251	58.58
18	Good	249	56.07
19	Experience	241	51.46
20	Start	240	48.54
21	Woman	240	43.51
22	Boyfriend	236	41.84
23	Life	229	53.56
24	Partner	225	43.51
25	Lot	224	45.61

Most Common Concepts Across and Within Groups

Table 2 presents the 25 most frequently used content words by all of the participants in the sample. Table 3 presents the 100 most frequently used content words by women with CSA histories and by non-sexually abused (NSA) women, separately. Note that the 10 most commonly used words by all of the participants were *sex* (97.91% in texts), *feel* (94.14%), *time* (91.63%), *know* (82.85%), *sexual* (83.26%), *relationship* (71.55%), *year* (71.55%), *love* (62.76%), *man* (61.92%), and *thing* (63.60%). Interestingly, the 10 most frequently used words by women with a history of CSA alone barely differ from the 10 most frequently used words by NSA women, suggesting that the most common concepts were used uniformly across all women in the sample. However, beyond the most common concepts, conceptual differences emerged between the two groups. The NSA group, for example, prominently used *friend* (57.43%), *fun* (35.64%), *love* (72.28%), and *virginity* (24.75) compared to the CSA group (*friend*, 37.68%; *fun*, 18.84%; *love*, 55.78%; *virginity*, 8.70%) (Tables 4 and 5). On the other hand, the CSA group used *pain* (15.22%), *guess* (32.61%), and *dirty* (22.46%) more than did the NSA group (*pain*, 1.98%; *guess*, 20.79%; *dirty*, 11.88%).

Relationship Between Theme Invocation and Participant Age Across Groups

Correlational analyses revealed that older women write about certain themes significantly less and other themes significantly more than their younger counterparts. Older women used the following themes *less* than younger women: virginity ($R = -.19$); abuse ($R = -.17$); and sexual activity ($R = -.16$, $p = .01$). On the other hand, older women focused more on the theme of attraction ($R = .18$) than did younger women.

Table 4
Most frequently used words in NSA and CSA sexual self-schemas.

	NSA	Frequency (*n*)	% in texts	CSA	Frequency (*n*)	% in texts
1	Sex	911	99.01	Sex	1115	97.10
2	Feel	473	91.09	Feel	819	96.38
3	Time	317	90.10	Know	392	81.16
4	Sexual	255	82.18	Time	380	92.75
5	Relationship	254	80.20	Sexual	366	84.06
6	Know	248	85.15	Man	262	62.32
7	Year	222	75.25	Thing	221	64.49
8	Love	208	72.28	Relationship	217	65.22
9	Guy	159	53.47	Year	217	68.84
10	Friend	150	57.43	Make	211	66.67
11	Man	146	61.39	Love	211	55.80
12	Boyfriend	136	49.50	Husband	166	36.23
13	Make	127	62.38	Try	162	60.14
14	Thing	127	62.38	People	158	50.72
15	Woman	119	47.52	Person	151	62.32
16	People	119	55.45	Thought	147	57.97
17	Start	116	53.47	Life	138	54.35
18	Good	112	62.38	Good	137	51.45
19	Person	111	57.43	Experience	134	50.00
20	Try	108	58.42	Enjoy	131	48.55
21	Experience	107	53.47	Partner	128	44.20
22	Thought	104	59.41	Guy	128	42.03
23	Lot	103	48.51	Sexually	125	50.00
24	Partner	97	42.57	Start	124	44.93
25	Girl	93	43.56	Lot	121	43.48
26	Life	91	52.48	Woman	121	40.58
27	Enjoy	86	41.58	Remember	115	34.78
28	Pretty	78	38.61	Happen	115	45.65
29	Sexually	72	39.60	Friend	110	37.68
30	See	71	43.56	Sexuality	108	47.10
31	Night	70	41.58	Abuse	105	40.58
32	Give	70	40.59	See	101	44.93
33	Look	70	45.54	Boyfriend	100	36.23
34	Met	68	39.60	Past	100	39.13
35	School	68	37.62	Look	98	43.48
36	Long	67	45.54	Find	92	40.58
37	Find	67	41.58	Body	88	36.96
38	High	67	39.60	Hard	86	37.68
39	Together	65	34.65	Right	85	39.86
40	Marry	63	31.68	Orgasm	84	30.43
41	Talk	62	36.63	Talk	84	36.23
42	Sexuality	61	36.63	Give	81	39.13
43	Young	61	35.64	Wrong	80	34.06
44	Open	60	32.67	Day	78	40.58
45	Day	58	34.65	Long	75	38.41
46	Age	57	30.69	Told	75	32.61
47	Month	55	35.64	Pretty	75	31.88
48	Remember	55	28.71	Girl	74	30.43
49	Interest	55	34.65	Guess	74	32.61
50	Happen	55	31.68	Need	72	36.23
51	Boy	53	22.77	Touch	70	31.88
52	Emotion	52	27.72	Emotion	70	28.99
53	Past	52	39.60	School	69	29.71
54	Kind	51	31.68	Young	68	34.06
55	Orgasm	50	21.78	Age	67	29.71
56	Work	50	38.61	Hate	66	28.26
57	Need	49	34.65	Bad	65	32.61
58	Body	49	32.67	Turn	64	28.26
59	Turn	49	35.64	Begin	64	31.16
60	End	48	32.67	Work	64	33.33
61	Fun	48	35.64	End	63	31.16
62	Touch	47	20.79	Hurt	62	28.26
63	Said	46	28.71	Marry	60	28.99
64	Sure	46	30.69	Night	59	26.81
65	Marriage	45	25.74	Interest	59	21.01
66	Right	45	31.68	Boy	59	22.46
67	Great	45	32.67	Rape	57	20.29
68	Told	44	30.69	Child	55	28.26
69	Live	44	28.71	Month	55	27.54
70	Parent	43	22.77	Said	55	24.64

Table 4 (*Continued*)

	NSA	Frequency (n)	% in texts	CSA	Frequency (n)	% in texts
71	College	42	24.75	Kiss	54	30.43
72	Kiss	42	27.72	Mind	53	29.71
73	Better	41	33.66	Live	53	27.54
74	Best	40	27.72	Stop	53	33.33
75	Oral	39	19.80	Mother	51	20.29
76	Husband	39	21.78	Point	51	26.81
77	Bit	39	19.80	Together	51	23.19
78	Comfortable	39	19.80	High	50	20.29
79	Current	39	27.72	Care	50	29.71
80	Point	39	21.78	Kind	49	25.36
81	Bed	38	22.77	Bed	49	26.09
82	Consider	38	29.70	Sister	48	16.67
83	Learn	38	27.72	Problem	48	23.91
84	Sleep	38	19.80	Sure	46	26.81
85	Bad	38	24.75	Brother	46	16.67
86	Call	38	23.76	Watch	46	23.91
87	Play	37	16.83	Dirty	46	22.46
88	Big	37	24.75	Understand	45	24.64
89	Understand	36	28.71	Dad	45	15.22
90	Mother	36	20.79	Mom	44	17.39
91	Move	35	24.75	Control	44	21.01
92	House	35	19.80	Trust	44	20.29
93	Broke	34	25.74	Better	44	21.74
94	Child	34	20.79	Mean	44	22.46
95	Care	33	25.74	Issue	43	20.29
96	Hard	33	25.74	Oral	43	16.67
97	Female	33	17.82	Met	43	18.84
98	Family	33	17.82	Desire	43	21.74
99	View	32	19.80	Comfortable	42	20.29
100	Lost	32	25.74	Close	42	25.36

Relationship Between Theme Invocation and Level of Relationship Commitment Across Groups

In order to examine differences in sexual self-schemas based on level of relationship commitment, we performed a Spearman correlation for rank-ordered variables between level of commitment and each sexual self-schema theme. Results showed that greater relationship commitment was associated with less focus on issues related to virginity ($r_s = -.14$) and marginally less focus on family ($r_s = -.12$), and greater focus on sexual activity ($r_s = .5$).

Differences in Theme Invocation as a Function of Childhood Sexual Abuse History

One-way analysis of variance (ANOVA) testing was performed to examine effects of sexual abuse history on sexual self-schema themes. Non-sexually abused (NSA) women were more likely than women with CSA histories to invoke the virginity theme, $F(1, 237) = 28.13$. Furthermore, NSA women were marginally more likely than CSA women to use words relating to relationships, $F(1, 237) = 3.85$. Women with a history of CSA were more likely to invoke themes of abuse and attraction to a greater extent than their non-abused counterparts, $F(1, 237) = 24.36$, and $F(1, 237)$, respectively.

Discussion

In the current study, we extracted seven sexual self-schema themes derived from responses to an open-ended prompt, confirming that sexual self-schemas can be captured and represented by the MEM. Results revealed both expected and new relationships with key demographic variables. Most importantly, we have established a new, low-cost, and easy-to-perform method for assessing facets of women's sexual self-schemas in a valid, highly useful way that breaks free from the drawbacks of using solely extrinsic or intrinsic methods. Using the MEM, we can extract meaningful concepts that are drawn from individuals' sexual self-schemata, regardless of language, which we might not otherwise be able to assess. Given that an individual's sexual self-schema is a network of interrelated cognitions related to self-relevant sexual information, it is most appropriate to measure the construct as it is actually represented in people's minds.

This approach revealed some aspects of sexual self-schemas that support previous research, particularly with respect to differences between the CSA group and the NSA group. Reissing et al. (2003) demonstrated that women with past sexual abuse had less positive sexual self-schemas than non-abused women, and Meston et al. (2006) found that CSA women were significantly less likely than NSA women to view themselves as passionate/romantic during sexual arousal. Confirming previous findings, the sexual self-schemas of CSA women in the present study tended to focus more on the theme of abuse than did those of NSA women. Indeed, abuse likely remains a salient theme throughout the lives of those who have experienced it, as CSA has been shown to have lasting effects in adulthood, particularly on the development of psychopathology

Table 5
Sexual self-schemas from participants' essays.

Sexual self-schema themes													
Theme 1: Family and development		Theme 2: Virginity		Theme 3: Abuse		Theme 4: Relationship		Theme 5: Sexual activity		Theme 6: Attraction		Theme 7: Existentialism	
House	0.51	High	0.55	Abuse	0.44	Important	0.41	Hand	0.44	Bring	0.44	Thought	0.39
Father	0.50	School	0.52	Happen	0.42	Person	0.40	Beautiful	0.35	Lesbian	0.36	Read	0.34
Call	0.49	Virginity	0.51	Ashamed	0.40	Term	0.38	Hold	0.35	Attractive	0.35	Understand	0.33
Mom	0.46	Lost	0.49	Cry	0.38	Consider	0.34	Penis	0.33	Physical	0.34	God	0.33
Mother	0.43	Guy	0.48	Disgust	0.38	Tend	0.34	Mean	0.31	Touch	0.34	Learn	0.33
Sister	0.41	College	0.46	Horrible	0.37	Intimacy	0.33	Kiss	0.31	Power	0.30	Worry	0.31
Left	0.39	Friend	0.43	Molest	0.37	Enjoy	0.33	Deep	0.30	Mind	0.29	Question	0.31
Night	0.39	Broke	0.43	Bad	0.35	View	0.32	Intercourse	0.30	Arouse	0.29	Sexuality	0.31
Pick	0.38	Met	0.42	Boy	0.34	Monogamous	0.32	Hard	0.29	Physically	0.28	Activity	0.30
Room	0.38	End	0.36	Told	0.34	Relationship	0.32	Make	0.29	Memory	0.28	Young	0.30
Bed	0.37	Month	0.35	Rape	0.32	People	0.31	Need	0.28	Man	0.28	Woman	0.30
Pretend	0.37	Girl	0.33	Hate	0.31	Partner	0.30	Thing	0.27	Fantasy	0.28	Moment	0.29
Parent	0.36	Virgin	0.31	Give	0.31	Past	0.30	Minute	0.27	Childhood	0.27	Grow	0.26
Start	0.35	Party	0.31	Scare	0.29	Commit	0.30	Oral	0.27	Avoid	0.27	Child	0.26
Clothes	0.34	Movie	0.30	Wrong	0.29	Idea	0.30	Total	0.26	Hope	0.27	Healthy	0.26
Throw	0.33	Boyfriend	0.29	Angry	0.28	Connect	0.30	Affect	−0.26	Ready	−0.29	Write	0.25
Stay	0.31	Serious	0.29	Embarrass	0.27	Comfortable	0.28					Top	−0.36
Walk	0.31	Fun	0.29	Promiscuous	0.27	Issue	0.28					Stop	−0.33
Short	0.31	Wait	0.28	Force	0.27	Point	0.28					Face	−0.31
Age	0.31	Fact	0.28	Control	0.27	Involve	0.27						
Mouth	0.30	Honest	0.28	Abusive	0.26	Share	0.27						
Spend	0.29	Weird	0.27	Allow	0.26	Meet	0.26						
Brother	0.28	Hear	0.27	Stupid	0.25	Open	0.26						
Remember	0.28	Cheat	0.26	Lie	0.25	Dad	−0.30						
Pretty	0.28	Year	0.26										
Sleep	0.28												
Hang	0.27												
Continue	0.26												
Said	0.26												
Eventually	0.26												
Kid	0.26												
Breast	0.26												
Watch	0.26												
Word	0.26												
Slept	0.25												

(Castellini, Maggi, & Ricca, 2014) and on sexual functioning (Leonard & Follette, 2002). It is possible that abuse themes were primed in CSA women due to the target of the original treatment study from which these writing samples came. Despite this potential priming, it does not negate the presence of the theme in the sexual self-schemas of the women with CSA histories. The sexual self-schemas of NSA women tended to focus more on the themes of virginity and relationships than did those of women with CSA histories. For non-abused women, the loss of their virginity and early sexual relationships are likely some of the most significant moments of their sexual history; this may not be true for abused women.

Furthermore, the MEM identified differences in the sexual self-schemas of younger and older women, which is suggested by earlier literature. In the present study, older women tended to focus *less* on themes of sexual activity, abuse, and virginity than did their younger counterparts. The decrease in focus on sexual activity perhaps reflects the reduced frequency of sexual activity in middle and older-aged women (Addis et al., 2006). It is likely that, as women age, their CSA experiences and the loss of their virginity become less chronically accessible, as they have may have accumulated more salient sexual experiences throughout their lives. Possible cohort effects, such as negative ageist sexual attitudes in older-aged women (Graf & Patrick, 2014), may also drive these differences.

In addition to the findings that converge with previous research, this approach uncovered specific nuances of sexual self-schemata that have not yet been explored.

The widely used Sexual Self Schema Scale (Andersen & Cyranowski (1994)) includes 50 experimenter-selected trait adjectives on which subjects can rate themselves. From this list, Andersen and Cyranowski extracted only three themes: passion/romance, openness to sexual experience, and embarrassment/conservatism. Our assessment of sexual self-schemas using the MEM identified seven unique themes that have not been previously reported in the sex research literature, notably family and development (the most robust of our extracted themes), as well as virginity, abuse, relationships, sexual activity, attraction, and existentialism. It is likely that the last theme, existentialism, indicates that a process of meaning-making, as reflection occurs when women respond to the sexual self-schema prompt. This theme may be more contextual in nature; as women write about their sexual selves, they may also be recalling the development of their sexual self-schemas over time. The identification of an existentialism-like theme is not entirely unprecedented. A study of self-schemas within and across American and Mexican cultures, which also used the MEM, extracted existentialism as a salient theme that was culturally specific to Americans (Ramirez-Esparza et al., 2011). These themes, novel to the sexual self-schema literature, may help researchers tailor future scale development to focus on salient aspects of sexual self-schemata.

The MEM also highlighted some specific, previously unreported correlations between certain sexual self-schema themes and level of relationship commitment. Greater relationship commitment was associated with less focus on themes of virginity and family, and significantly greater focus on the theme of sexual activity. These findings highlight the importance of relationship variables in our conceptualization of sexual self-schema.

These results may have important clinical implications. Clinicians who are treating CSA women could employ open-ended questions targeting sexual self-schema throughout the treatment process in an effort to mark changes in the use of abuse-related themes. In addition to acting as a marker of treatment progress, sexual self-schema related interventions using the MEM could be particularly efficacious for women who present with both CSA histories and sexual dysfunction. While there are established treatment protocols for female sexual dysfunction, there are few empirically validated treatments for sexual dysfunction in female survivors of CSA (Brotto, Seal, & Rellini, 2012; Meston et al., 2013), suggesting that there may be different maintaining factors of sexual dysfunction in this population. When working with this population, clinicians might first target the improvement of abuse-focused sexual self-schemas, assessing the construct with the MEM periodically, by asking clients to engage in expressive writing on topics related to their sexual identities. With these expressive writing samples, clinicians would be able to determine the degree to which their clients are focusing on past abuse. Once themes of abuse become less apparent over time, clinicians may then treat their patients' sexual dysfunction with the traditional methods that are not validated in CSA populations.

Some limitations of this research should be recognized. First, this study utilized a relatively small sample size. While the size of our sample would be considered strong in other areas of research, examinations of language generally rely on samples that are five to ten times larger than ours. Second, the list of sexual self-schema themes provided here is likely non-comprehensive. While the MEM is adept at highlighting nuance in common themes, the method ignores the themes that are not present in a large percentage of the sample. With a much larger sample, it would be possible to extract even more detailed themes, thus recognizing themes that may have been present, yet undetectable, in the smaller sample. Third, this research was conducted in the context of an expressive writing treatment study intended to decrease symptoms of depression, PTSD, and sexual dysfunction in women with histories of childhood sexual abuse (Meston et al., 2013). Therefore, women in CSA group may have been primed to their sexual abuse status prior to the expressing writing exercise. Yet, we chose to focus our analyses on the sexual self-schema prompt, which occurred at intake, in order to prime the topic of sex and sexuality more broadly in both the CSA and the NSA groups. Multiple women in the sample who reported a history of childhood sexual abuse did not use any words identified in the "abuse" theme, indicating that the "abuse" theme was likely not primed any more or less than any other aspect of the sexual self-schema. Finally, this approach does not inherently capture valence, meaning that the themes themselves will not be conveyed in terms of positivity or negatively. Valence is likely an important dimension of sexual self-schemata. Though the MEM is sensitive to semantic context, which often reveals some indication of valence, the procedure can only partially capture this construct. Other software or analytical approaches, like LIWC (Pennebaker, Booth, & Francis, 2007), may be better suited to the consideration of valence.

To our knowledge, ours is the first study to employ the Meaning Extraction Method to assess sexual self-schemas in women. By offering women the opportunity to write spontaneously on their implicit understanding of their sexual selves, the MEM provides a uniquely nuanced perspective on sexual self-schemas. With the ease of acquiring natural language data, this method can provide us with far more rich information than can traditional explicit or implicit methods alone.

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