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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