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EXAMINING THE MEASUREMENT INVARIANCE OF THE REVISED SOCIOSEXUAL ORIENTATION INVENTORY AMONG HISPANIC AND NON-HISPANIC WHITE COLLEGE WOMEN

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ABSTRACT

I examined whether the Revised Sociosexual Orientation Inventory (SOI-R) was invariant between Hispanic/Latina and Non-Hispanic White (NHW) undergraduate women. I performed confirmatory factor analysis to assess model fit and used increasingly restrictive models to test invariance. I included 208 Hispanic/Latina women and 190 NHW women. The CFI and RMSEA model fit statistics (CFI=0.98, RMSEA=0.06 (90% confidence interval=0.04-0.08, p-value=0.16) showed that the model fit well. I constrained factor loadings to be equal in both groups to test metric invariance. I observed non-significant differences in model fit (ΔX^2 (9)=88.67, p>0.95, ΔCFI=0.003, ΔRMSEA=-0.011). I also constrained intercepts to be equal to test scalar invariance. I observed non-significant differences in model fit (ΔX^2 (9)=92.08, p>0.24, ΔCFI=-0.001, ΔRMSEA=-0.002). I also constrained residual variances to be equal to test residual invariance. I observed non-significant differences in model fit (ΔX^2 (9)=112.49, p>0.19, ΔCFI=-0.002, ΔRMSEA=-0.002). The SOI-R is invariant between Hispanic/Latina and NHW undergraduate women.

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Chapter 1 Introduction

Sociosexuality, which is defined as an individual's inclination to have casual or uncommitted sexual relationships, was first described in women by Alfred Kinsey et al. in 1953 (Institute for Sex Research et al., 1953). Kinsey, a biologist, conducted the first systematic study of human sexuality in the United States and found that, in contrast to the beliefs of the day, human sexuality was not limited to heterosexual pairings within the context of marriage. In fact, same sex pairings, premarital sex, and extra-marital sex were relatively common (Institute for Sex Research et al., 1953). Early research on sociosexuality examined how an individual's inclination toward restricted/low (i.e., desiring few uncommitted sexual relationships) or unrestricted/high (i.e., feeling comfortable engaging in sex with partners without a committed relationship) sociosexuality influenced their short- or long-term mating goals, as marriage and cohabitation were assumed to be the end goals for most people (Simpson & Gangestad, 1991). This assumption, and the origin of the concept of sociosexuality within the spheres of biology and evolutionary psychology, influenced how researchers developed their questionnaires to measure this construct. For instance, initial research did not measure or differentiate between attitudes pertaining to sociosexuality and actual willingness to engage in uncommitted sexuality (Lyell, 2015). It was also assumed that because an individual was unrestricted in their attitudes, they would be able to engage in a high number of uncommitted sexual encounters without taking into account the potential for lack of available sexual partners (Simpson et al., 2004; Simpson & Gangestad, 1991).

Sociosexuality is posited to be relatively stable in individuals over the course of their lives and affected by heritable factors, social and cultural attitudes, and past life experiences (Simpson & Gangestad, 1991; Penke & Asendorpf, 2008). Unrestricted sociosexuality is associated with higher propensity for casual sex (Simpson & Gangestad, 1991). People with more unrestricted sociosexuality reported higher self-esteem and life satisfaction after engaging in casual sex, although there was no relationship between self-esteem and life satisfaction after casual sex for those with restricted sociosexuality (Vrangalova & Ong, 2014).

Sociosexuality is also associated with women's risk perception in sexually risky situations; women with unrestricted sociosexuality, relative to women with more restricted sociosexuality, were less likely to judge the risk of sexual assault as being high when presented with hypothetically risky dating and social situations (Yeater et al., 2015). In a prospective study that used latent profile analysis to compute models of risk of sexual assault in freshmen women, three risk profiles emerged (Yeater et al., 2020): The first profile included women who reported low alcohol use and restricted sociosexuality, the second profile included women who reported high alcohol use and a medium level of restricted sociosexuality, and the third profile included women who reported a high level of alcohol use and unrestricted sociosexuality. Women in the second profile had more severe levels of sexual assault victimization at six month follow up than women in the first profile, and women in the third profile had more severe levels of sexual assault victimization than women in the first and second profiles, even

when controlling for baseline severity of prior sexual assault (Yeater et. al., 2020). These studies suggest that sociosexuality is an important factor both in understanding women's sexual behavior as well as their risk for unwanted sexual experiences, including sexual assault.

The History of the Sociosexual Orientation Inventory

In 1991, Simpson and Gangestad developed and validated a measure for quantifying the extent or degree of individuals' sociosexuality. The Sociosexual Orientation Inventory (SOI) measured sociosexual orientation along a unidimensional construct from restricted to unrestricted. The SOI was developed with the aim of disentangling individual differences in attitudes and beliefs about sex outside of committed relationships from sexual behavior. Simpson and Gangestad (1991) posited that people with unrestricted sociosexual attitudes may not act on sexual desire, meaning it was possible for those with unrestricted sociosexual attitudes to still exhibit more restricted sexual behavior, despite their unrestricted sexual attitudes, and that sexual behaviors and attitudes had been largely conflated in previous research (Simpson & Gangestad, 1991). Additionally, while previous research examined sociosexuality outside of the context of romantic relationships, Simpson and Gangestad's (1991) measure was designed for use with individuals who were in a committed romantic relationship (Simpson et al., 2004), although the rational for this was not described clearly.

The SOI was developed based on data collected from male and female undergraduate students at Texas A&M University. Participants were asked to

complete a survey, which included six questions about overt sexual behavior (e.g., how many times have you had sex in the past month?), two questions about covert sexual behavior (e.g., how frequently do you think about sex), and three questions about attitudes toward sexual behavior (e.g., sex without love is ok). The authors used eigenvalue scree analysis to identify five items that were associated with sociosexuality, although the measure itself treated sociosexuality as a single factor based on the analyses. A scree plot is a line plot of eigenvalues of factors in a downward curve from largest to smallest. The point at which the eigenvalue curve straightens is an indication that factors to the right of that point are trivial (Cattell, 1966). However, scree plots have been criticized for extracting too few factors from the data (Walach et al., 2010). Ultimately, Simpson and Gangestad (1991) developed a seven-item inventory, with items loading onto a single factor, which accounted for 39.2% of the total variance in responses (Simpson and Gangestad, 1991).

To test the SOI, Simpson and Gangestad administered the measure along with additional questions, the origins of which were not described, about frequency of sexual encounters within a committed relationship, sexual satisfaction, sex-related anxiety, and sex-related guilt to 144 heterosexual couples at Texas A&M University. Comparison of the SOI and these other questions found that the constructs presumably measured by those questions were different from sociosexuality as measured by the SOI. When discriminant validity was examined, the SOI did not correlate with absolute frequency of sexual encounters within a committed relationship, and scores on the SOI were

statistically independent from measures of sexual satisfaction, sex-related anxiety, and sex-related guilt. These analyses resulted in a measure of sociosexuality that was independent of sex drive or interest in sex (i.e., participants could have a high urge or desire for sex, but still display restricted sociosexual orientation if they were not interested in sex outside of relationships) (Simpson & Gangestad, 1991). Table 1 presents the questions and answer formats of the SOI.

The SOI was widely used, and has been translated into at least 27 languages, administered in at least 52 countries (International Sexuality Description Project, 2003), and, per Google Scholar, it has been cited 1,983 times. Despite its widespread adoption, several researchers have questioned whether the construct of sociosexuality was in fact unidimensional as suggested by the factor structure derived by Simpson and Gangestad (1991) (Jackson & Kirkpatrick, 2007; Webster & Bryan, 2007). When Webster and Bryan (2007) used Confirmatory Factor Analysis to examine the responses to the SOI that they administered to a large sample of undergraduate students, they found that a dual factor model including a behavioral and attitudinal factor was a better fit to the data than a unidimensional model. Webster and Bryan (2007) also found that the dual-factor model was better equipped to elucidate gender differences in the degree to which individuals displayed consistent sociosexual attitudes and behaviors (e.g., those sexual interactions) (Webster & Bryan, 2007). Jackson and Kirkpatrick (2007) performed a factor analysis including the SOI and several additional measures of mate choice and long-term mating strategies to the

Table 1

SOI Questions and Response Formats

SOI Questions	Response Type	Response Range
1. With how many different partners have you had sex (sexual intercourse) within the past year?	Free Response	
2. How many different partners do you foresee yourself having sex with during the next five years? (Please give a specific, realistic estimate)	Free Response	
3. With how many different partners have you had sex on *one and only one* occasion?	Free Response	
4. How often do you fantasize about having sex with someone other than your current dating partner?	Likert-Type	1(never)- 8(at least once a day)
5. Sex without love is OK	Likert-Type	1(I strongly disagree)- 9(I strongly agree)
6. I can imagine myself being comfortable and enjoying "casual" sex with different partners	Likert-Type	1(I strongly disagree)- 9(I strongly agree)
7. I would have to be closely attached to someone (both emotionally and psychologically) before I could feel comfortable and fully enjoy having sex with him or her	Likert-Type	1(I strongly disagree)- 9(I strongly agree)

Note. SOI= Sociosexual Orientation Inventory

behavioral and attitudinal factors, an additional factor should be included to measure restricted or unrestricted preference (Jackson & Kirkpatrick, 2007).
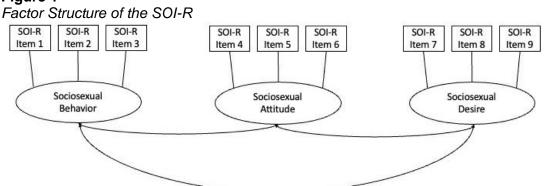
In 2008, Penke and Asendorpf identified several problems with the SOI as it was conceived and proposed a revised version of the Sociosexual Orientation Inventory (SOI-R). When considering the construct to be reflected in their new measure, Penke and Asendorpf proposed that a multifactorial model may provide a better fit than a unidimensional model because of the findings of Webster and Bryan (2007) and Jackson and Kirkpatrick (2007). They also noted that the open response formats of items 1-3 within the SOI created non-normally distributed data, that there was not a standardized scoring method of the SOI, and that the phrasing of question four (i.e. How often do you fantasize about having sex with someone other than your current dating partner) made it impossible to administer in a sensible way to people who were not currently in romantic relationships (Penke, 2011; Penke & Asendorpf, 2008).

The SOI-R was developed in Germany and tested on German-speaking, heterosexual adults from the ages of 18 to 50 who had prior sexual experience. A large sample of German-speaking individuals completed the online survey, which included demographic questions about age, native language, religious affiliation, degree of religiosity, gender, the SOI, and the SOI-R. Participants were also asked about previous sexual history, values in a relationship, and beliefs about how the opposite sex viewed them.

To rectify the issues identified with the SOI, Penke and Asendorpf modified the response types to items one and two, reworded item four so that it

could be answered regardless of relationship status, dropped item seven, and added four additional items (e.g., In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?). Table 2 presents the questions in the SOI-R. Confirmatory factor analysis revealed three factors that together constitute the latent construct of sociosexuality: (a) a behavioral factor, which measured how people actually acted in response to their sociosexuality and was measured by items one through three; (b) an attitudinal factor, which measured individual's attitude toward uncommitted sex and was measured by items four through six; and (c) a desire factor, which measured individuals' motivation to pursue sex outside of committed relationships and was measured by items seven through nine. Figure 1 portrays the factor structure of the SOI-R as derived by Penke & Asendorpf, (2008).

Figure 1
Factor Structure of the SOI-R

Note. SOI-R= Revised Sociosexual Orientation Inventory

Penke and Asendorpf examined the predictive validity of the three-factor measure of sociosexuality by recruiting heterosexual couples without children between the ages of 20 and 30, having them complete survey measures in a baseline interview, separating partners and having them interact with an

Table 2

SOI-R Questions and Response Formats

SOI-R Questions	Response Type	Response Range	Comparison to SOI
1. With how many different partners have you had sex within the past 12 months?	Likert-Type	0 (zero)- 9(20 or more)	Question consistent, response type changed
2. With how many different partners have you had sexual intercourse on *one and only one* occasion?	Likert-Type	0 (zero)- 9(20 or more)	Question consistent, response type changed
3. With how many different partners have you had sexual intercourse without having an interest in a long-term committed relationship with this person?	Likert-Type	0 (zero)- 9(20 or more)	New question
4. Sex without love is OK.	Likert-Type	1(strongly disagree)- 9(strongly agree)	Original to the SOI
5. I can imagine myself being comfortable and enjoying "casual" sex with different partners.	Likert-Type	1(strongly disagree)- 9(strongly agree)	Original to the SOI
6. I do *not* want to have sex with a person until I am sure that we will have a long-term, serious relationship.	Likert-Type	1(strongly disagree)- 9(strongly agree)	New question
7. How often do you have fantasies about having sex with someone with whom you do *not* have a committed romantic relationship?	Likert-Type	1(never)- 9(at least once per day)	Rephrased so that it is answerable regardless of relationship status
8. How often do you experience sexual arousal when you are in contact with someone with whom you do *not* have a committed romantic relationship?	Likert-Type	1(never)- 9(at least once per day)	New question
9. In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?	Likert-Type	1(never)- 9(at least once per day)	New question

Note. SOI= Sociosexual Orientation Inventory, SOI-R= Revised Sociosexual Orientation Inventory

opposite-sex confederate to examine their level of flirtation outside of a committed relationship, and examining the association between level of flirtation (based on codes from taped interactions) and sociosexuality as measured by the SOI and SOI-R. Participants were asked to complete a follow up questionnaire one year after their baseline appointment in which they were asked about changes in their relationship status. Those who remained in the same relationship at follow up were found to have a more restrictive sociosexuality as measured by the SOI and SOI-R. The SOI-R revealed that the behavioral and desire factors were better predictors of extra-relationship flirtatious behavior and future relationship status than attitude, particularly in men (Penke & Asendorpf, 2008).

The SOI-R, Gender, and Race

According to Google Scholar, the SOI-R has been cited 1,120 times, is currently available in both a five-item and a nine-item version, has been translated into 25 languages, and is widely used in research (Penke, n.d.). According to the authors, the SOI-R is appropriate for individuals with a range of ages, educational levels, marital statuses, and sexual orientations, including heterosexual, gay, lesbian, and bisexual (Penke, 2011). Men have consistently reported higher levels of sociosexuality than women as measured by both the SOI and SOI-R (Penke & Asendorpf, 2008; Simpson & Gangestad, 1991), however, the variance within gender was higher than the variance between genders (Simpson et al., 2004; Simpson & Gangestad, 1991). This indicates that the SOI-R is invariant among men and women, although the researchers did not

utilize gold standard data analytic methods (Wang et. al., 2018) specific to examining measurement invariance to draw these conclusions. Additionally, despite men having higher levels of unrestricted sociosexuality than women in all racial groups, racial group has been shown to moderate the relationship between gender and sociosexuality. Specifically, Black men and Black women have the highest difference in level of restriction in sociosexuality, followed by Hispanic and Non-Hispanic White (NHW) men compared with Hispanic and NHW women, while Asian men and Asian women were closest in their levels of restriction in sociosexuality (Sprecher et al., 2013). Despite observing differences by gender and race in level of sociosexuality, the authors did not test for measurement invariance between these groups (Sprecher et al., 2013).

Invariance Testing of the SOI

Despite the widespread use of the SOI-R in research, very few studies have been conducted to examine if this measure is invariant in any population (Wang et al., 2018). Nascimento et al. (2018) tested the measurement invariance of the Portuguese language version of the SOI-R in a population of Brazilian undergraduate students and found that it was partially invariant between men and women, as configural and metric invariance were substantiated yet, scalar invariance was not. These results suggested that the measure had equivalent factor structures and loadings of items in both groups, but the values of item means were not equivalent in both groups. When item eight (i.e., How often do you experience sexual arousal when you are in contact with someone with whom you do *not* have a committed romantic relationship?) was left unconstrained,

partial scalar invariance was satisfied, meaning that when the intercepts of item eight were allowed to vary between men and women, the model fit improved in each group. Nascimento et al. (2018) posited that this may reflect a difference in how men and women experience or define sexual arousal outside of committed relationships. Despite scalar invariance not being satisfied, the three-factor structure was well supported in a Brazilian sample (Nascimento et al., 2018). In addition, Barrada et al. (2018) examined the measurement invariance of the Spanish language version of the SOI-R among undergraduate students at a Spanish university and found that the SOI-R showed configural, metric, scalar, and residual invariance between people of different ages (between the ages of 18 and 26) and genders (Barrada et al., 2018). However, no studies examining the measurement invariance of the English version of the SOI-R in English speaking Hispanic or Latino people have been conducted to date in the United States.

Wang et al. (2018) called for further testing of measurement invariance within the field of evolutionary psychology and discussed specifically the SOI as a measure that is frequently used but not well established to be invariant. They identified three potential sources of bias that could result in measurement variance; specifically construct, method, and item bias (Wang et al., 2018). Since the SOI-R was developed in Germany and tested on German populations (Penke and Asendorpf, 2008), it is possible that either construct bias (i.e. bias that occurs when the constructs being measured differ among cultures) (Davidov et al., 2014) or item bias (i.e. bias that occurs due to a differential likelihood of

endorsing items within a measure, based on culture of origin) (He & van de Vijver, 2012) could result in measurement variance between a German and an American population or a NHW and a Hispanic or Latino population. Measures found to vary between different groups are not inherently useless, but rather can provide important information about the expression or function of a concept within another culture and how it may vary from the culture on which the measure was developed (Putnick & Bornstein, 2016).

Existing Research on Sociosexuality and Sexual Behavior in Hispanic and Latino Women

Between 2010 and 2020, the Hispanic and Latino population grew by 23% to 62.1 million people in the United States (Jones et al., 2021), and as the Hispanic and Latino population of the United States increases, it is crucial to examine whether existing measures (often developed using NHW samples) measure the same construct in racially/ethnically diverse groups. Because there is a dearth of research examining sociosexuality within Hispanic and Latino populations, it is relevant to review related research that supports the rationale for such work. Thus, the following section will review research focused on sexual behavior in this population, which focuses primarily on sexual behavior as a risk factor for unplanned pregnancy or transmission of sexually transmitted infections.

Previous research on sexual behavior in Hispanic and Latino populations has identified cultural factors that may be associated with differing attitudes toward sexuality from the cultural attitudes most commonly measured in NHW individuals. Strong traditional values of *familismo*, or cohesion within the family,

respeto, or respect for authority figures, and *marianismo*, or purity and femininity for women, are thought to play a role in decreased Hispanic and Latina women's inclination toward risky sexual behavior (Smith, 2015). *Familismo* and *respeto* are thought to constrain opportunities for sexual expression, particularly in younger women who may still live with their parents, enabling parental monitoring of activities (Morales-Campos et al., 2012), however, it may also result in limited access to information about safe sex practices or less dating experience and knowledge of effective ways of refusing sexual advances (Smith, 2015). *Marianismo*, despite the high value placed on sexual purity, may also reduce Hispanic and Latina women's sexual self-efficacy, as it also places high value on subservience of women to men, particularly when paired with *machismo*, the value of strength and dominance in men (Smith, 2015). Self-efficacy describes an individual's belief in their ability to perform a behavior and can affect how an individual's knowledge and skills are reflected in their actual behavior (Bandura, 1977). Decreased sexual self-efficacy may limit the ways in which women are able to refuse or initiate sexual behavior, negotiate condom use or sexual pleasure, and communicate sexual risk with their partners, which has the potential to increase the risk of sexual assault and sexually-transmitted infections (Sionéan, et al., 2002; Brar, et al., 2020), while decreasing sexual pleasure (Bond, et al., 2020).

Religiosity is also thought to moderate sociosexuality among Hispanic and Latina women, with higher levels of religiosity associated with more restricted sociosexuality (Penke & Asendorpf, 2008). The majority of Hispanic and Latino

individuals in the United States identify as Catholic (Taylor et al., 2012), a religion

that has strong prohibitions against sex outside of marriage and a prohibition

against use of hormonal or barrier contraception (*Catechism of the Catholic*

Church, n.d.). However, the level of religiosity in Hispanic and Latino populations

varies by generation, with 69% of foreign-born Hispanic or Latino people

identifying as Catholic, but only 59% of second generation and 40% of third

generation Hispanic or Latino individuals in the US identifying as such (Taylor et

al., 2012). While more religious women are less likely than less religious women

to engage in sexual relationships and more likely than less religious women to

have a later age of first sexual intercourse (Koletič et al., 2021; Edwards et al.,

2008), higher levels of religiosity are also associated with less experience in

dating and less skill in avoiding or refusing sexual advances (Miller & Gur, 2002).

Existing research into sexual behavior in Hispanic and Latina women has

focused primarily on sexual behavior as a health risk, with emphasis on delaying

age of first sexual intercourse, or promoting condom or other sexually-transmitted

infection and reproductive barriers. It has also focused on the level of

acculturation to American culture among recently immigrated Hispanic and Latina

girls and women as a risk factor for engaging in sexual behavior. When

examining sexual behavior within recently immigrated Hispanic/Latino

populations in the United States, several studies have found that Hispanic and

Latina women with a higher level of acculturation to American culture were more

likely than their less acculturated Hispanic or Latina counterparts to engage in

high-risk behaviors such as having a greater number of sexual partners (Marín & Flores, 1994; Sabogal et al., 1995; Schwartz et al., 2014).

The fact that increased level of acculturation is associated with greater sexual behavior is consistent with findings from a study that recruited individuals from different parks and public areas of New York City and compared them by racial group. In this study, Hispanic and Latino individuals who adopted American cultural attitudes about sex had more positive views on sexual behavior relative to Hispanic and Latino individuals who did not adopt American cultural attitudes (Molina & Tejada, 2018). Conversely, those who preferred to maintain the sexual attitudes of their culture of origin had a more negative attitude about sexual activity (Molina & Tejada, 2018). In sum, the available research suggests that in recently immigrated Hispanic and Latino populations, religiosity and level of acculturation has a large impact on both how sex is viewed and what sexual behaviors people engage in. However, there is a dearth of research examining sociosexuality in highly acculturated Hispanic and Latino populations. Therefore, it is unclear if these factors continue to influence sexual behavior in populations that are highly acculturated to NHW culture.

New Mexico is unique in that it is the first majority-minority state in the United States, with a large Hispanic/Latino population (Maestas et al., 2007). Because of New Mexico's place in history as a state whose Indigenous peoples were colonized by Spanish settlers and Spain then settled in the territory and remain today. As such, it offers a unique look at a Hispanic/Latino population that retains a strong sense of identity, while also being highly acculturated (Doan &

Stephan, 2006). Despite the previously discussed work showing that cultural differences in recently immigrated Hispanic and Latino populations play a role in sexual behavior, research by Yeater et al. (2022) including the highly acculturated student population at the University of New Mexico found that a measure assessing beliefs in adherence to sexual assault scripts (i.e., The Sexual Assault Script Scale; SASS) was invariant between Hispanic and Latina populations and NHW populations.

Study Aims

This study examined whether the SOI-R was invariant among Hispanic/Latina and NHW college women. Based on prior invariance testing of the SASS (Yeater et al., 2022) and the high level of acculturation of Hispanic/Latina students at the University of New Mexico (Crawford et al., 2017), it was expected that the SOI-R would be invariant between Hispanic/Latina women and NHW women.

Chapter 2 Method

The present study is a secondary data analysis using data collected by the Trauma Research Laboratory (Grant number: R21AA021878-02; Yeater et al., 2020). The aim of the original study was to explore prospectively the relationship between college women's cognitive processing of sexual assault risk and sexual assault at six-month follow up. Participants in the original study included 481 heterosexual or bisexual unmarried freshmen women between the ages of 18 and 24 at the University of New Mexico.

Statistical Methods

Although the study by Penke and Asendorpf (2008) does not explicitly state how the data were analyzed, it appears that the scales for each item were treated as continuous data. As a result, data for the current study were also assumed to be continuous variables and analyzed accordingly. Differences in the distribution of answers for individual SOI-R items between Hispanic/Latina and NHW women were assessed using a two-sample t-test. The omega coefficient was used to assess the internal consistency of items in the SOI-R (Revelle & Condon, 2019).

Confirmatory factor analysis (CFA) was used to assess the fit of these data to the original model proposed by Penke and Asendorpf (2008) (shown in Figure 1) in the total sample of 398 as well as in Hispanic/Latina and NHW samples individually. The Hispanic/Latina and NHW samples were tested for measurement invariance using the methods described in Chen et al. (2005). Testing for measurement invariance requires examining increasingly restricted

models to assess the fit of the model to the data and determining if these data fit differently between groups. First, in order to test whether or not the factor structure is consistent between the two groups, configural invariance is tested. If configural invariance holds, factor loadings are constrained to be equal in both samples and difference in fit of the models is assessed in order to test metric invariance. Next, the difference in model fit after constraining both factor loadings and intercepts to be equal is assessed in order to test scalar invariance. Lastly, the difference in model fit after factor loadings, intercepts, and residual variances are constrained to be equal is assessed to test residual invariance (Chen et al., 2005).

When comparing fit of the models, the null hypothesis is that the model is invariant between the two groups. Change in X^2 value was calculated, but due to its high sensitivity to large sample sizes (Martin-Lof, 1974), a significant X^2 value was not sufficient to reject the null hypothesis. A change in the comparative fit index (CFI) less than or equal to 0.01 and a change in the root mean square error of approximation (RMSEA) less than 0.015 was also used to suggest that the null hypothesis that the models fit equally well should not be rejected (Klein, 2016). All analyses were completed using the lavaan (version 0.6-11) and semTools (version0.5-5) packages in RStudio (version 2022.07.2)

Chapter 3 Results

The study utilized the SOI-R data collected at baseline from the original study. Only the 43.3% of the sample who identified as Hispanic/Latina (n=175) or Mexican American (n=33) and the 39.5% (n=190) of the sample that identified as Non-Hispanic White in the original study were included, for a total sample size of 398. Due to the small number of women who identified as Mexican American, the Hispanic/Latina and Mexican American categories were collapsed into one category (n=208), which was labeled as Hispanic/Latina.
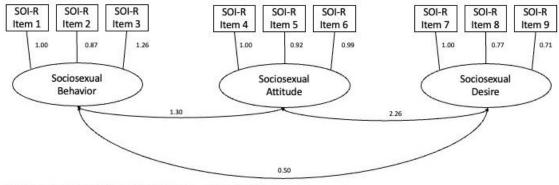
The omega coefficient of the items was 0.89 indicating good internal consistency of items in the SOI-R. Table 3 presents the correlations between items of the SOI-R for Hispanic/Latina and NHW women. There was no statistically significant difference in the answers for individual items between Hispanic/Latina and NHW students. Table 4 presents the means and standard deviations for each item by group.

Confirmatory Factor Analysis

A confirmatory factor analysis revealed that the three-factor model proposed by Penke and Asendorpf (2008) fit the data for the combined sample of Hispanic/Latina and NHW college women reasonably well. Although the X^2 test statistic was statistically significant, indicating some misfit of the data ($X^2(21)=53.03$, p<0.001), the CFI and RMSEA model fit statistics showed that the three-factor model fit reasonably well (CFI=0.98, RMSEA=0.06, 90% confidence interval=0.04-0.08, p=0.31). Figure 2 shows the factors and factor loadings for individual items.

Figure 2
Results of the Confirmatory Factor Analysis of the SOI-R Using Combined Data from Hispanic/Latina and NHW College Women

X²(21)=53.03, p<0.001 CFI=0.98, RMSEA=0.06, 90% confidence interval=0.04-0.08, p=0.31

Note. SOI-R= Revised Sociosexual Orientation Inventory, NHW=Non-Hispanic White

Measurement Invariance of the Revised Sociosexuality Orientation Inventory

Table 3
Correlation Matrix of the SOI-R Items

	SOI 1	SOI 2	SOI 3	SOI 4	SOI 5	SOI 6	SOI 7	SOI 8	SOI 9
SOI 1	--								
SOI 2	0.62	--							
SOI 3	0.73	0.76	--						
SOI 4	0.63	0.31	0.40	--					
SOI 5	0.30	0.24	0.39	0.67	--				
SOI 6	0.44	0.35	0.47	0.69	0.67	--			
SOI 7	0.14	0.13	0.17	0.38	0.37	0.35	--		
SOI 8	0.24	0.10	0.21	0.31	0.34	0.38	0.64	--	
SOI 9	0.14	0.08	0.15	0.31	0.31	0.33	0.61	0.54	--
Race/Ethnicity	0.04	0.04	-0.00	-0.08	-0.03	-0.07	-0.01	-0.01	0.02

Note. SOI-R= Revised Sociosexual Orientation Inventory

Table 4
Means, Standard Deviations, and Test Statistics for each SOI-R Item for Hispanic/Latina and NHW Women

Question	Mean (SD) Hispanic/Latina (n=208)	Mean (SD) Non-Hispanic White (n=190)	T statistic (degrees of freedom), P-value
SOI 1	2.45 (1.38)	2.34 (1.50)	t(384.38)= 0.75, p=0.45
SOI 2	1.82 (1.17)	1.72 (1.24)	t(386.94)=-0.83, p=0.41
SOI 3	1.92 (1.44)	1.93 (1.49)	t(389.94)=-0.03, p=0.98
SOI 4	3.74 (2.50)	4.17 (2.85)	t(377.32)=-1.60, p=0.11
SOI 5	3.08 (2.51)	3.21 (2.52)	t(392.59)=-0.51, p=0.61
SOI 6	3.53 (2.46)	3.89 (2.64)	t(386.26)=-1.41, p=0.16
SOI 7	3.65 (2.31)	3.68 (2.27)	t(393.97)=-0.13, p=0.89
SOI 8	2.80 (1.93)	3.06 (1.98)	t(390.78)=-1.32, p=0.19
SOI 9	2.54 (1.91)	2.47 (1.88)	t(393.84)= 0.37, p=0.71

Note. SOI-R= Revised Sociosexual Orientation Inventory

The three-factor model also fit the data reasonably well for Hispanic/Latina and NHW samples individually. Both samples had a statistically significant X^2 value (Hispanic/Latina $X^2(21)=43.53$, $p<0.01$), NHW $X^2(21)=45.14$, $p<0.01$), indicating some misfit of the data. However, the CFI and RMSEA model fit statistics showed that the three-factor model fit reasonably well in both samples (Hispanic/Latina: CFI=0.98, RMSEA=0.06 90% confidence interval=0.03-0.09, $p=0.23$; NHW: CFI=0.98, RMSEA=0.07 90% confidence interval=0.04-0.10, $p=0.16$). Factor loadings and variances for each item and variances for each factor in the total sample can be found in Table 5.

Measurement Invariance

Metric invariance was tested by constraining factor loadings to be equal between the Hispanic/Latina and NHW groups. Results revealed a non-significant difference in model fit between the configural and metric models (ΔX^2 (6)=3.41, $p=0.76$, ΔCFI=0.001, ΔRMSEA=-0.006). Next, scalar invariance was tested by constraining the factor loadings and intercepts to be equal between the Hispanic/Latina and NHW groups; these results also showed a non-significant difference in model fit between the metric and scalar models (ΔX^2 (6)=7.96, $p=0.24$, ΔCFI=-0.001, ΔRMSEA=-0.002). Finally, residual invariance was tested by constraining factor loadings, intercepts, and residual variances to be equal between the Hispanic/Latina and NHW groups. Results revealed a non-significant difference in model fit between the scalar and residual models (ΔX^2 (9)=12.45, $p=0.19$, ΔCFI=-0.002, ΔRMSEA=-0.002). Table 5 presents the factor

loadings and variances for each item and variances for each factor for

Hispanic/Latina and NHW women.

Table 5
Factor Loadings of Items, Variances of Items, and Factors in the SOI-R in the Total Sample and for Hispanic/Latina and NHW Women

	Total Sample		Hispanic/Latina		Non-Hispanic White	
	Factor Loadings	Variances	Factor Loadings	Variances	Factor Loadings	Variances
Behavior	-	1.22	-	1.08	-	1.38
SOI 1	1.00	0.84	1.00	0.81	1.00	0.86
SOI 2	0.87	0.53	0.88	0.51	0.85	0.54
SOI 3	1.26	0.21	1.30	0.25	1.22	0.18
Attitude	-	4.78	-	0.61	-	5.14
SOI 4	1.00	2.37	1.00	1.85	1.00	2.96
SOI 5	0.92	2.27	0.99	1.97	0.85	2.03
SOI 6	0.99	1.85	1.00	1.67	0.98	1.68
Desire	-	3.69	-	0.58	-	3.44
SOI 7	1.00	1.54	1.00	1.35	1.00	1.68
SOI 8	0.77	1.61	0.72	1.67	0.83	1.52
SOI 9	0.71	1.70	0.69	1.76	0.73	1.65

Note. SOI-R= Revised Sociosexual Orientation Inventory, NHW=Non-Hispanic White

Chapter 4 Discussion

The primary aim of the current study was to evaluate the measurement invariance of the SOI-R among Hispanic/Latina and NHW college women. The SOI-R was developed in a German-speaking population to measure individual's inclination to have sex outside of a committed relationship (Penke & Asendorpf, 2008). The English version is widely used, but the invariance of the measure had not been validated in an English-speaking Hispanic/Latina population and an English speaking NHW population.

A confirmatory factor analysis of the three-factor SOI-R model was conducted using the combined Hispanic/Latina and NHW college women data together. The results from this confirmatory factor analysis suggested that the model fit was adequate for the data. The tests of measurement invariance between the Hispanic/Latina and NHW groups suggested that the SOI-R was invariant across configural, metric, scalar, and residual models. These results suggest that the SOI-R measures a similar construct in Hispanic/Latina and NHW college women.

Emotional and Behavioral Outcomes Associated with Higher Sociosexuality

Higher levels of sociosexuality have been shown to influence sexual risk behavior in varied ways including sexual risk taking and risk processing (Hall and Pichon, 2014, Yeater et al., 2015). For example, higher levels of sociosexuality are associated with higher levels of sexual risk-taking behavior in Black women (Hall & Pichon, 2014). Additionally, sociosexuality in conjunction with alcohol

intoxication has also been shown to affect women's ability to process and detect risk in hypothetical social situations depicting risk for sexual assault (Yeater et al., 2015). While there are negative outcomes associated with higher levels of sociosexuality, higher levels of sociosexuality are not inherently negative. Research suggests that they may buffer against negative emotional consequences of casual sex. For instance, individuals with higher levels of sociosexuality had higher levels of thriving and lower levels of distress following casual sex than did individuals with lower levels of sociosexuality (Vrangalova & Ong, 2014).

Sociosexuality and Sexual Behavior in Racial/Ethnic Groups

As noted, the majority of the research on sexual behavior in racial or ethnic minority populations focused on sexual behavior as a risk factor for sexually transmitted infection or unplanned pregnancy. In fact, "in identifying risk factors for threats to sexual health, ethnic minority status itself is often identified as a risk factor" (Lewis, 2004). This attitude pathologizes sexuality in these populations, treating it as a potentially dangerous behavior to be eliminated, rather than a part of the human experience or a target for risk reduction strategies (Lewis, 2004, Tsai, et al., 2016, Ford et al., 2019, Hargons, et al., 2021). Having a nuanced understanding of sociosexuality and sexual behavior may allow for future researchers to examine sexual behavior in minority populations while still incorporating concepts like sexual self-efficacy.

This approach is consistent with efforts in the field of public health to break the tradition of viewing race itself, rather than racism, as a risk for negative health

outcomes (Cogburn, 2019). Researchers who describe race itself as a risk factor for negative health outcomes, like cardiovascular disease, rather than treating race as a proxy variable for sociocultural behavior or understanding the role of racism in these outcomes, risk both missing key causes of negative health outcomes and furthering racial essentialism (Silverman-Lloyde et al., 2021). Boyde and colleagues (2020) proposed new guidelines for articles submitted to public health journals that discuss health outcomes by race. These include clearly defining race, naming racism as a cause of health disparities, not using genetic interpretations of race, soliciting patient input on research, identifying how research on racial health inequities may impact public policy and clinical practice, and citing experts in the field's knowledge of racism and its effects (Boyde et al., 2020).

Application of similar guidelines to psychological research looking at racial differences may help researchers to avoid the judgmental and paternalistic tone exemplified in much of the past research into sexuality in minority populations. Additionally, understanding how cultural factors, religiosity, and social and familial factors influence sociosexuality may help to illuminate contributing factors to differences that may be found between cultures. However, in order to conduct high quality research, it is essential to ensure that frequently used measures, such as the SOI-R, are invariant in the research populations of interest. Furthermore, researchers must work to understand the reasons, beyond race alone, for measurement non-invariance when it is identified.

Reflections on the Development of the SOI and SOI-R

Simpson and Gangestad (1991) clearly outlined the construct of sociosexuality and reasons why a validated measure of the construct would provide an important contribution to the field. However, the paper lacked a clear description of how items were generated and whether the item wording was tested or examined by experts prior to administration to their first subject pool. The authors also developed the measure to be administer to people in partnered relationships, as evidenced by the wording of item four, but the rational for this decision was not clearly explained. While it is likely that some of these practices are a result of standards developed in the intervening 30 years between the publication of the study and now, use of inductive methods and cognitive interviews and consultation with expert judges while developing scale items are currently considered best practices in scale development (Boateng, et al., 2018). Yet despite failing to reach these gold standards, the SOI continues to be used in studies published as recently as 2023. Thus, researchers may consider whether it is prudent to continue to use a measure whose development does not meet current standards for measurement development.

Although the SOI-R was developed in part to remedy some of the psychometric issues observed in the SOI (Penke & Asendorph, 2008), some questions remain regarding the methodology used by the authors. In Penke and Asendorpf's 2008 revision to the SOI-R, the authors stated that their subject pool consisted of German-speaking men and women, which suggests that the measure was originally developed in German, despite the measure and paper

being published in English. While translation from one language to another generally increases the risk of item bias in measures (He & van de Vijver, 2012), this is particularly concerning given that this measure deals with an aspect of sexuality. Linguists have observed that "sexual language is a contextually-bound phenomenon that cannot be properly examined without looking at the context in which it occurs" (Crespo-Fernández, 2018). The development of a measure of an aspect of sexuality and translation of items in that measure without providing clear evidence of invariance, then, would seem to be inconsistent with good practice in measurement development (Boateng, et al., 2018).

In her critique of evolutionary psychology, the field from which the SOI and SOI-R arose, Linda Gannon (2002) wrote that "the three disciplines underlying evolutionary psychology—biology, anthropology, and psychology—do not share common methodologies, data sources, or logic structures." It seems possible, then, that some of the issues described above are a reflection of differing practices between the fields of evolutionary and clinical psychology, rather than shortcomings of the studies themselves. However, researchers in other branches of psychology may want to consider if the theoretical assumptions made in evolutionary psychology including the pressures of reproduction and survival, individual and group selection, natural selection, and specificity of brain adaptations (Gannon, 2002) influence how measures in the field are developed and tested when considering adopting those measures in their own research.

Limitations and Future Directions

This is a secondary data analysis from research that was focused on sexual assault risk among first year college women. As a result, no data exist regarding factors that may contribute to measurement variance in the SOI-R including acculturation, first language spoken, social group, or religiosity (He & Van de Vijver, 2012, Davidov, et al., 2014). Additionally, the data comes from students at The University of New Mexico and may not be generalizable to students from other institutions or to individuals in the same age range who are not enrolled in college. The Hispanic/Latina population is large and diverse, thus future work may endeavor to test measurement invariance of the SOI-R among other groups of Hispanic/Latina individuals. Because research suggests that men consistently report higher levels of sociosexuality on the SOI-R, future researchers should consider testing the measurement invariance of the SOI-R among Hispanic/Latino and NHW men.

Conclusions

Sociosexuality is thought to be a relatively stable lifetime trait that is affected both by a person's external environment and culture and by a person's internal beliefs (Simpson & Gangestad, 1991; Penke & Asendorf, 2008). An individual's level of sociosexuality is thought to play into their risk of sexual assault (Yeater et al. 2015; Yeater et al. 2020), their sexual behavior (Hall & Pichon, 2014), and their feelings about casual sex (Vrangalova & Ong, 2014). In order to quantify this trait in individuals, it is important to have a well-validated measure of the construct, which includes determining if the measure is invariant

across different populations. Utilization of a measure that has not been well-validated cross-culturally risks measuring concepts inaccurately and further contributes to the over-pathologizing of minority or other underrepresented groups. Given that the SOI-R is a frequently cited measure of sociosexuality, it is essential to test whether it is invariant in populations of interest. Based on this research, the SOI-R, which measures sociosexuality, is invariant among English speaking Hispanic/Latina college women and English speaking NHW college women.

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