

PSYCHOMETRICS

Validation of the French-Canadian Version of the Sexual Inhibition and Sexual Excitation Scales-Short Form (SIS/SES-SF): Associations With Sexual Functioning, Sociosexual Orientation, and Sexual Compulsivity



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ABSTRACT

Introduction: The Dual control model proposes that both excitatory and inhibitory processes are responsible for the human sexual response.

Aim: To validate the French-Canadian translation of the Sexual Inhibition and Excitation Scales-Short Form (SIS/SES-SF) by exploring its factor structure and by investigating its capacity to retrospectively predict sexual functioning and behaviors, namely, sociosexual orientation and sexual compulsivity.

Methods: A French-Canadian translation of the SIS/SES-SF was created using forward-backward translation. A community sample of 362 men and 420 women completed an online survey. The factor structure and the measurement invariance between men and women was explored using Exploratory Structural Equation Modeling. Predictive power of the scales was tested using Multiple Linear Regression models using a corrected threshold ($P < .008$).

Main outcome measures: Sexual functioning was assessed using the *International Index of Erectile Function* and the *Female Sexual Function Index* while sexual compulsion and sociosexual orientation were measured using the *Sexual Compulsion Scale* and the *Revised Sociosexual Orientation Inventory*, respectively.

Results: The original three-factor solution of the SIS/SES-SF was replicated. All three scales showed acceptable internal consistency and good temporal stability. Yet, results only supported configural measurement invariance between men and women, suggesting that their scores cannot be directly compared. Overall, for both men and women, higher sexual excitation (SES) was significantly predictive of better sexual functioning, while higher sexual inhibition due to threat of performance failure (SIS1) was a significant predictor of lower sexual functioning. Both sexual compulsivity and sociosexual orientation were significantly predicted by higher SES and lower sexual inhibition due to threat of performance consequences (SIS2).

Conclusion: These results support the cross-cultural transferability of the SIS/SES-SF and the Dual control model to French-Canadian men and women, highlighting the utility for clinicians to evaluate both excitatory and inhibitory factors associated with sexual dysfunction and sexual behaviors. **Nolet K, Guay JP, Bergeron S. Validation of the French-Canadian Version of the Sexual Inhibition and Sexual Excitation Scales-Short Form (SIS/SES-SF): Associations With Sexual Functioning, Sociosexual Orientation, and Sexual Compulsivity. Sex Med 2021;9:100374.**

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KEY WORDS: Dual control model; SIS/SES; Sexual functioning; Sexual compulsivity; Sociosexual orientation

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INTRODUCTION

The dual control model (DCM) of sexual arousal is well established and has a strong conceptual foundation. First introduced by Bancroft and Janssen,¹ the DCM postulates the existence of two independent, theoretical neurophysiological systems that regulate sexual arousal: one activated by excitatory cues and mediating approach motivation and behaviors, and one activated by inhibitory cues and mediating avoidance. At a state level, the sexual

response would be the result of the balance between both excitatory and inhibitory processes in a given situation. At a trait level, individuals would vary in the sensitivity of their excitatory and inhibitory systems, leading to a higher or lower propensity to experience sexual arousal in a wide range of situations. While adaptive, extreme variations of these systems could lead to problematic sexual response and behaviors. For example, too much inhibition could result in sexual dysfunction while abnormally high excitability could lead to out-of-control sexual behaviors, particularly in conjunction with a lack of sexual inhibition.^{2,3}

The Sexual Inhibition and Sexual Excitation Scales⁴ (SIS/SES) have been developed to assess the postulated processes of the DCM. Using exploratory and confirmatory factor analysis,⁴ three relatively independent subscales or systems have been identified: sexual excitation (SES), sexual inhibition due to threat of performance failure (SIS1), and sexual inhibition due to threat of performance consequences (SIS2). Since the original study, the SIS/SES has been successfully validated with samples of gay⁵ and heterosexual men.⁶ Although the SIS/SES has been validated for use with women,⁷ another scale measuring more specific aspects of women's sexuality was developed, the Sexual Excitation/Sexual Inhibition Inventory for Women⁸ (SESII-W) and later adapted for men⁹ (SESII-W/M). Finally, a short form of the original scale, the SIS/SES-SF,¹⁰ was also created by selecting items that were invariant in their measurement characteristics between men and women, resulting in a 14-item scale. The present study aimed to validate the French-Canadian translation of the SIS/SES-SF for its use in predicting sexual functioning and behaviors, namely sociosexual orientation and sexual compulsivity, by examining its factor structure and the invariance in measurement of its factors between men and women.

Studies have found links between the SIS/SES and sexual functioning. The SIS1 has been the strongest and most consistent predictor of self-reported erectile dysfunction among the SIS/SES subscales, for both heterosexual and gay men while no such association was found with rapid ejaculation.¹¹ High SIS1 was also found to be predictive of erectile dysfunction, low sexual desire, and low orgasmic function.¹² In a small clinical sample, Sarin, Amsel, and Binik¹³ found that men meeting DSM-IV-TR criteria for hypoactive sexual desire disorder had lower SES scores, while those meeting criteria for erectile dysfunction had higher SIS2 scores compared to healthy controls. Data specifically focusing on the predictive power of the SIS/SES for women's sexual functioning are scarce. Quinta Gomes et al.¹² found positive associations between the SES and sexual arousal, sexual desire, lubrication, and orgasmic function, thus giving weight to the idea that the SIS/SES might not properly capture the full range of inhibiting cues in women.⁸ Yet, studies using the SISII-W or the SISII-W/M support the relevance of the DCM in understanding women's sexual response and function, with Sexual Excitability (SE, equivalent to SES) being a positive predictor and Sexual Inhibition (SI, equivalent to SIS1) a negative one (see¹⁴ for a complete review).

Associations between the DCM and sexual behaviors and attitudes have also been documented, with the most robust ones being with high excitability and low inhibition due to threat of consequences. For men, higher SES and lower SIS1 were predictive of frequency of any sexual interaction.⁴ For both men⁴ and women,⁷ higher SES and lower SIS2 scores were associated with a higher sociosexual orientation, namely a positive attitude toward, and past behaviors of, uncommitted sexual encounters. The same associations were found with higher sexual sensation-seeking,¹⁵ understood as the propensity to seek out novel or risky sexual stimulation, and with sexual compulsivity,¹⁶ characterized as intrusive and distressing sexual thoughts. Interestingly, all three scales of the SIS/SES were significant predictors of hypersexuality in two independent, mixed samples of men and women of all sexual orientations, with the SES and SIS1 being positive predictors, and SIS2 being a negative one.^{17,18} Looking at sexual compulsivity in a mixed sample of married, heterosexual men and women, high Arousalability (a subscale of SE) and low Relationship Importance (a subscale of SI) were predictive of higher sexual compulsivity scores.¹⁹ However, high Inhibitory Cognitions (a subscale of SI) were predictive of higher sexual compulsivity for men only. Taken together, these results underscore the explanatory power of the DCM in the scientific study of human sexuality, as both excitatory and inhibitory mechanisms were found relevant in understanding sexual functioning and problematic sexual behaviors in men and women.

Hence, the DCM is gaining traction in the international scientific community, with translation and cultural adaptations of the SIS/SES being published in recent years. To date, the scales have been translated in Spanish,²⁰ German,²¹ Portuguese,¹² Italian,²² Finnish,²³ Polish,²⁴ and several South Asian languages.²⁵ For the most part, the three-factor structure has been replicated in these translations. Yet, several of the published studies have dropped numerous items from the original version,^{12,20,23,24} Using a more parsimonious version of the scale, such as the SIS/SES-SF, could help to replicate its factorial structure across cultures and genders, thus enabling better comparison between studies and helping identify processes contributing to human sexual response.

Given the cross-cultural relevance of the DCM, the objective of the present study was to develop and validate the psychometric properties of the French-Canadian version of the SIS/SES-SF for predicting sexual functioning and behaviors in men and women. The first step would be to replicate the original factor structure of the SIS/SES-SF,¹⁰ showing that the translated questionnaire measured the same underlying construct as postulated by the DCM (ie, SES, SIS1, SIS2). The next step would be to find evidence that the scales measured the same construct the same way for men and women, that is, measurement invariance, allowing for meaningful comparison between both populations. Finally, proof of validity of the scales in sex research would be obtained by predicting differences in relevant construct above and beyond other predicting variables (eg, age, sexual orientation, marital

status). Here, sexual functioning, sociosexual orientation, and sexual compulsivity were used as criteria for testing validity of the scales. For both men and women, we expected the SIS1 to be a negative predictor of sexual functioning, and the SES and SIS2 to be respectively positive and negative predictors of sociosexual orientation and sexual compulsivity.

METHODS

Participants

A community sample of 827 French-speaking Canadians (387 men, 439 women, 1 non-binary) were recruited. Fifty participants were excluded to ensure reliability of the data and a more homogeneous sample: one had missing data on the SIS/SES-SF, 21 failed to answer correctly the three attention questions, and 23 were identified as multivariate outliers on the SIS/SES-SF. The final sample was composed of 362 men (46.3%) and 420 women (53.7%). Sociodemographic characteristics of the final sample can be found in Table 1. Participants had to report having been sexually active (alone or with a partner) at least once in the past six months and be aged between 18 and 45 years old ($M = 24.66$, $SD = 5.67$) to be included in the study. Both inclusion criteria were set to ensure valid data on the sexual functioning questionnaires (see below). Lottery draws of 25 gift cards (Amazon.ca, value: 100\$ CAD) among all participants was set-up as a monetary incentive for participation.

Procedure

A French-Canadian version of the SIS/SES-SF was developed by using a forward-backward translation methodology. Two bilingual researchers on our team with a clinical and research expertise in human sexuality worked on the translation. The French-Canadian version of the scale was then submitted to two people independent from our team (a professional translator and a clinical psychologist with an expertise in human and couple therapy) for a backward translation. Inconsistencies between both translations were then resolved by the first author of this paper by selecting the wording that was the closest to the original meaning of the scale.

Participants were recruited on a major French-Canadian university campus and social medias. Questionnaires were answered online via the Qualtrics Research Suite secure platform using a unique, anonymous link for each participant. Exclusion criteria verified on the online platform within the sociodemographic questionnaire (22 individuals were excluded that way). This procedure, supplemented by the IP blocking feature of the platform, ensured that a person was not able to complete the questionnaire more than once. For the test-retest reliability analysis, a second unique link was automatically sent one month later to participants who completed to first set of questionnaires, until 100 men and 100 women completed the SIS/SES-SF a second time. Informed consent was obtained on the first page of the online questionnaire. Three attention verification questions were

Table 1. Sociodemographic data of the final sample (n = 782)

	n	%
Biological sex		
Man	362	46.3
Woman	420	53.7
Gender		
Man	359	45.9
Woman	420	53.6
Other	4	0.5
Sexual preference*		
Heterosexual	695	88.9
Non-monosexual	28	3.6
Homosexual	59	7.5
Relational status		
Single	218	27.9
Engaged without cohabitation	293	37.5
Engaged with cohabitation	266	34.0
Divorced/Widowed	5	0.6
Ethnic identity		
European/Caucasian	677	86.6
African	22	28.0
Asian	3	0.4
Arab	23	2.9
Latino	23	2.9
Native	17	2.2
Other	17	2.2
Education		
Primary/Secondary	73	9.3
Collegial	388	49.6
Undergraduate	231	29.5
Graduate	90	11.5
Current student status		
No	172	22.0
Yes, part time	53	6.8
Yes, full time	557	71.2
Mean Age (SD)	24.66	(5.67)
Range	18	45.0

*Categories were aggregated for easier reading (1 to 3 = heterosexual, 4 = non-monosexual, 5 to 7 = homosexual)

inserted inside the online survey, with the same measurement scale as its host questionnaire. The project received ethical approval from the university's institutional review board.

Measures

Sociodemographic Questionnaire. Participants were asked about basic sociodemographic information via a homemade questionnaire (age, ethnic identity, relationship status, education, occupation). Questions about biological sex and gender were asked using a three-point nominal scale (man, woman, other), with the possibility for nonbinary participants to specify their response in open-ended questions. Non-binary participants were also asked to select their preferred sex-specific version of the SIS/SES-SF and of

the sexual functioning questionnaire. Sexual preferences were measured using the Kinsey seven-point Likert scale, ranging from 1 (exclusively heterosexual) to 7 (exclusively homosexual).

Sexual Inhibition and Sexual Excitation Scales-Short form (SIS/SES). The SIS/SES-SF¹⁰ is a 14-item questionnaire that assesses excitation and inhibition processes based on the DCM of sexual arousal.¹ Each item proposes a hypothetical scenario leading to an increase in, or loss of, sexual arousal. Participants are asked to indicate if it corresponds to their typical response in such a scenario using a four-point Likert scale ranging from 1 (“strongly agree”) to 4 (“strongly disagree”). As the original scales,⁴ the items are divided into 3 subscales: sexual excitation (SES, 6 items), sexual inhibition due to threat of performance failure (SIS1, 4 items), and sexual inhibition due to performance consequences (SIS2, 4 items).

International Index of Erectile Function (IIEF). Men’s sexual functioning was assessed using the well validated IIEF.²⁶ The questionnaire consists of 15 items answered on a five-point Likert scale, with higher scores indicating higher sexual functioning and satisfaction. Three dimensions of men’s sexual functioning were assessed for this study: erectile function, orgasmic function, and sexual desire.

Female Sexual Function Index (FSFI). Women’s sexual functioning was assessed with the widely used FSFI.²⁷ The 19-item questionnaire is answered using a five-point Likert scale, with higher scores indicating higher sexual functioning. As no specific links between SIS/SES-SF scores and satisfaction were expected, only five of the six subscales were used in this study: desire, arousal, lubrication, orgasm, and pain.

Sexual Compulsion Scale (SCS). Sexual compulsivity was assessed via the SCS.^{28,29} Using a four-point Likert type scale, participants are asked to endorse a series of 10 statements related to sexually compulsive behaviors, sexual preoccupations, and sexually intrusive thoughts.

The Revised Sociosexual Orientation Inventory (SOI-R). Sociosexual orientation corresponds to the tendency to engage in casual, uncommitted sexual relationships. Using a nine-point Likert type scale, the 9-item revised scale³⁰ measures individual differences in past behaviors in terms of number of casual sexual partners, attitudes towards uncommitted sex, and desire to engage in sexual activities with partners with whom no romantic relationship exists.

Data Analysis

Analyses were conducted with Mplus 6.12. Factorial analyses were performed using Exploratory Structural Equation Modeling

(ESEM) with polychoric correlations and WLSMV estimator. Unlike Confirmatory Factorial Analysis, it is possible, with ESEM, to test the fit of a specified structure on a data set without fixing item cross-loadings to zero, thus resulting in a more realistic model: factor cross-loadings are freely estimated but targeted toward zero using an oblique rotation. An overall model, using data from both men and women, was first estimated. The goodness-of-fit of this model was evaluated with χ^2 testing, root-mean-square error of approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Weighted Root Mean Square Residuals (WRMR). RMSEA values of ≤ 0.06 , CFI and TLI values of ≥ 0.9 , and WRMR values of ≤ 1.000 are deemed acceptable.³¹

Measurement invariance of scores on the SIS/SES-SF for men and women was tested following the taxonomy of Marsh et al.³² Measurement invariance is tested by successively comparing the fit of models with more and more stringent parameter constraints: configural invariance (same structure ie, no constraints), weak or metric invariance (same factor loadings), strong or scalar invariance (same item intercept/thresholds), strict or residual invariance (same measurement error) and complete factorial invariance (same latent mean, variances, and covariances). Each model is compared to the previous one, with invariance established with fit indices being stable between each step, that is, nonsignificant χ^2 difference testing, ΔCFI and $\Delta\text{TFI} \leq -0.01$, and $\Delta\text{RMSEA} \leq 0.015$.^{33,34}

Reliability of the SIS/SES-SF factors was assessed using test-retest correlation and ordinal alpha. Criterion validity was tested using multiple linear regression analysis with heteroscedasticity-consistent standard errors estimators (HC4). The SIS/SES-SF factors were used to predict men and women’s sexual functioning subscales, sexual compulsion, and sociosexual orientation, controlling for age, sexual preferences, and relationship status. Sexual preferences and relationship status were dichotomized (heterosexual vs other, single vs other). Continuous predictors were mean centered. Bonferroni corrections were applied to individual predictor significance testing ($P < .008$).

RESULTS

Factor Structure and Measurement Invariance

Data fit indices for the SIS/SES-SF of the different models tested can be found in Table 2. First, the total group model, that is, using men and women scores without group distinction, fitted the data well, with all indices reaching acceptable levels. Then, configural invariance was tested by freely estimating the factor loadings for men and women separately. Data fit was improved by doing so, with lower RMSEA, and higher CFI and TFI indices, meaning that the general structure of the SIS/SES-SF was the same for men and women. Yet, weak measurement invariance could not be reached: while some indices were improved ($\Delta\text{RMSEA} = -0.002$, $\Delta\text{TFI} = 0.005$), fixing the factor loading values to be the same between men and women resulted in a

Table 2. Comparison of model fit for measurement invariance on the SIS/SES-SF between men and women

	χ^2	RMSEA	[90% CI]	CFI	TFI	WRMR
Total group	165.87	0.053	[0.044 - 0.062]	0.959	0.928	0.806
Configural invariance	193.03	0.047	[0.036 - 0.057]	0.967	0.941	0.873
Weak invariance	243.976*	0.045	[0.036 - 0.054]	0.959	0.946	1.191

Notes. CI = Confidence interval; CFI = Comparative fit index; RMSEA = Root mean square error of approximation; TLI =Tucker-Lewis index; WRMR = Weighted Root Mean Square Residual.

*significant χ^2 difference testing at $P < .05$

model with significantly worse data fit (significant χ^2 difference, Δ CFI = -.008, WRMR < 1.000). Our results indicate that while the same latent variables (ie, SES, SIS1, and SIS2) were found on the SIS/SES-SF, items contributed differently to their measurement between men and women. Direct comparison of scores on these latent variables is thus impossible, resulting in two distinct models for men and women (see Figure 1 and 2, respectively).

Reliability

Test-Retest Reliability. Mean follow-up time was 33.29 days ($SD = 6.55$). Temporal stability was high, but somewhat higher for men than women for the SES (men: $r = 0.833$, $P < .001$, women: $r = 0.759$, $P < .001$), and the SIS2 (men: $r = 0.850$, $P < .001$, women: $r = 0.715$, $P < .001$), while the reverse pattern was found for the SIS1 (men: $r = 0.752$, $P < .001$, women: $r = 0.787$, $P < .001$).

Internal Consistency. The internal consistency was good for the SES (men: ordinal $\alpha = 0.78$, women: ordinal $\alpha = 0.75$), and acceptable for both the SIS1 (men: ordinal $\alpha = 0.68$, women:

ordinal $\alpha = 0.70$) and the SIS2 (men: ordinal $\alpha = 0.66$, women: ordinal $\alpha = 0.70$).

Prediction of Sexual Functioning and Behaviors

Means and standard deviations for each criterion variable can be found in Table 3.

Men’s Sexual Functioning. Significant linear regression models were found for erectile function, $F(6, 351) = 26.69$, $P < .001$, $R^2 = 0.329$, orgasm, $F(6, 335) = 2.66$, $P = .016$, $R^2 = .042$, and sexual desire, $F(6, 351) = 5.36$, $P < .001$, $R^2 = 0.088$ (see Table 4 for complete models). As expected, SES was a significant, positive predictor of sexual desire, $\beta = 0.246$, $t(351) = 5.59$, $P < .001$, and SIS1 was a significant, negative predictor of erectile function, $\beta = -0.154$, $t(351) = -3.15$, $P = .002$. For orgasm, while the model was significant, no SIS/SES variable was a significant predictor.

Women’s Sexual Functioning. Significant linear regression models were found for sexual desire, $F(6, 408) = 19.81$, $P < .001$, $R^2 = 0.201$, sexual arousal, $F(6, 398) = 15.43$, $P < .001$,

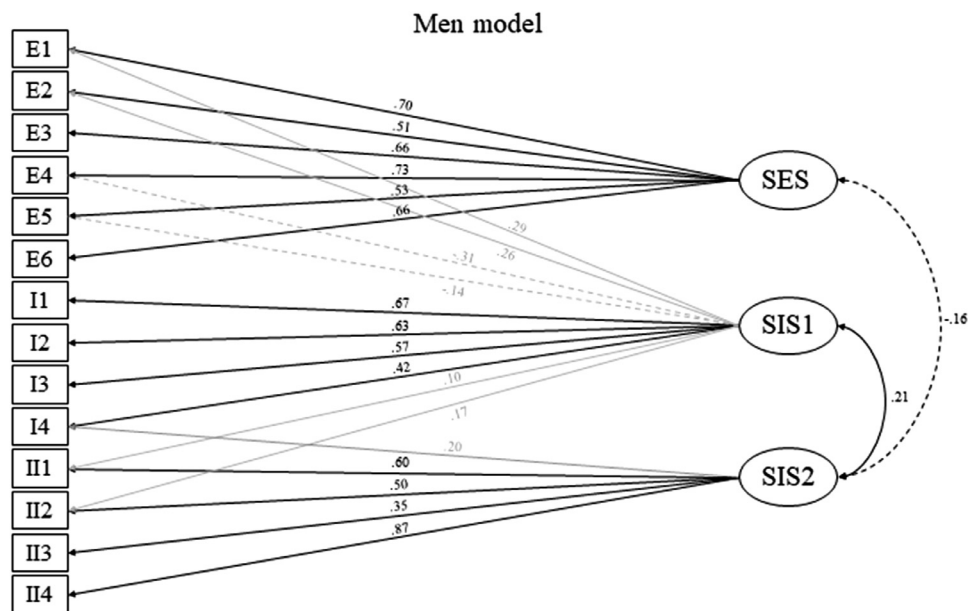


Figure 1. Factor structure of the SIS/SES-SF for men (n = 362).

Notes. Black arrows represent factor loadings and gray arrows item cross-loadings.

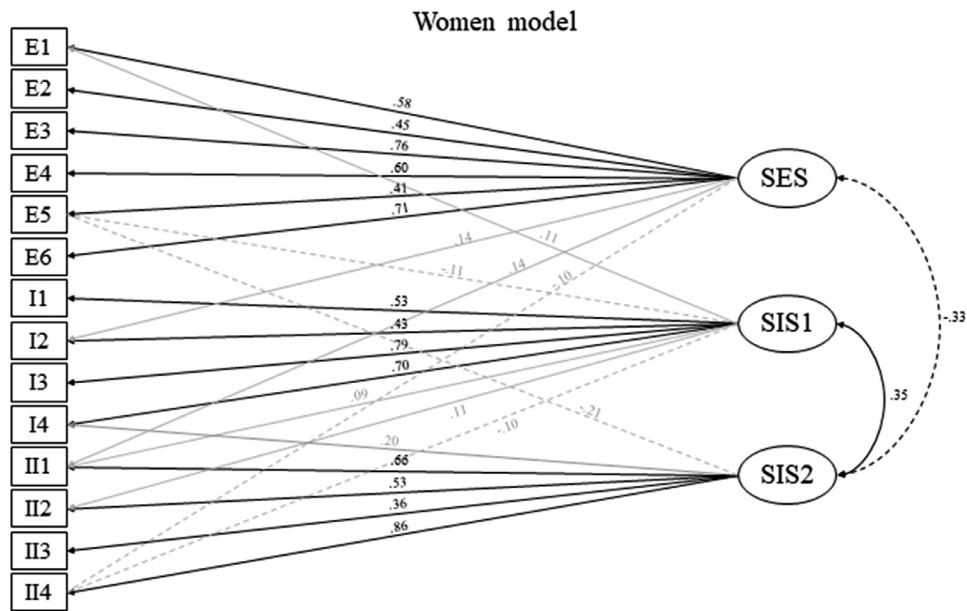


Figure 2. Factor structure of the SIS/SES-SF for men (n = 420).
Notes. Black arrows represent factor loadings and gray arrows item cross-loadings.

Table 3. Mean scores and standard deviation for sexual functioning subscales, sexual compulsivity, and sociosexual orientation

	Men (n = 362)			Women (n = 420)		
	M	SD	(Range)	M	SD	(Range)
Sexual desire	7.45	1.72	(2-10)	3.98	1.15	(1.2-6)
Sexual arousal	-	-	-	4.78	1.09	(0-6)
Erectile function	23.57	8.09	(1-30)	-	-	-
Lubrication	-	-	-	5.28	0.95	(0-6)
Orgasm	9.12	1.50	(0-10)	4.34	1.44	(0-6)
Pain	-	-	-	5.28	0.98	(0-6)
Sexual compulsions	1.70	.58	(1-4)	1.59	0.58	(1-4)
Sociosexual orientation	4.50	1.64	(1-9)	4.10	1.54	(1-9)

Table 4. Multiple regression models for men’s sexual functioning variables

Predictors	Erectile function		Orgasm		Sexual desire	
	B	(β)	B	(β)	B	(β)
Age	0.046	(0.030)	0.007	(-0.027)	0.011	(0.004)
Sexual preference	-1.903	(-0.082)	-0.197	(-0.045)	0.162	(0.033)
Marital status	9.012	(0.526)*	0.447	(0.139)	0.548	(0.151)
SES	0.311	(0.109)	-0.015	(-0.029)	0.148	(0.246)*
SIS1	-0.609	(-0.154)*	-0.083	(-0.112)	-0.065	(-0.077)
SIS2	0.021	(0.007)	0.002	(0.003)	-0.026	(-0.034)

*P < .008 (Bonferroni correction: .05 / 6)

R² = 0.209, lubrication, F(6, 399) = 6.09, P < .001, R² = 0.094, orgasm, F(6, 398) = 4.61, P < .001, R² = 0.056, and pain, F(6, 361) = 4.33, < .001, R² = 0.065 (see Table 5 for complete models). SES was a significant, positive predictor of sexual desire, β = 0.288, t(408) = 5.97, P < .001, and sexual arousal,

β = 0.139, t(398) = 2.90, P = .004. SIS1 was a negative, significant predictor of sexual desire, β = -0.284, t(408) = -5.62, P < .001, sexual arousal, β = -0.418, t(398) = -8.03, P < .001, lubrication, β = -0.287, t(399) = -5.18, P < .001, orgasm, β = -0.182, t(398) = -3.54, and pain, β = -0.200, t(361) = -3.43, P < .001.

Table 5. Multiple regression models for women’s sexual functioning variables

Predictors	Sexual desire		Sexual arousal		Lubrication		Orgasm		Pain	
	B	(β)	B	(β)	B	(β)	B	(β)	B	(β)
Age	-0.022	(-0.108)	-0.013	(-0.068)	-0.006	(-0.034)	0.029	(0.113)	0.014	(0.080)
Sexual preference	-0.076	(-0.019)	-0.085	(-0.022)	-0.110	(-0.032)	0.056	(0.011)	0.024	(0.006)
Marital status	0.004	(0.002)	0.292	(0.112)	0.216	(0.095)	-0.060	(-0.017)	-0.125	(-0.050)
SES	0.112	(0.288)*	0.052	(0.139)*	0.014	(0.042)	0.029	(0.058)	0.035	(0.104)
SIS1	-0.144	(-0.284)*	-0.200	(-0.418)*	-0.120	(-0.287)*	-0.115	(-0.182)*	-0.084	(-0.200)*
SIS2	-0.035	(-0.072)	-0.012	(-0.026)	-0.011	(-0.026)	-0.014	(-0.023)	0.004	(0.009)

*P < .008 (Bonferroni correction: .05 / 6)

Sexual Compulsion and Sociosexual Orientation. For men, significant linear regression models were found for sexual compulsion, $F(6, 351) = 13.53, p < .001, R^2 = 0.206$, and sociosexual orientation, $F(6, 349) = 35.58, P < .001, R^2 = 0.346$ (see Table 6 for complete models). Sexual compulsion was positively predicted by SES, $\beta = 0.400, t(351) = 7.36, P < .001$, but surprisingly not by SIS2 once corrections for multiple comparisons were applied, $\beta = -0.104, t(351) = -1.98, P = .048$. Sociosexual orientation was positively predicted by SES, $\beta = 0.404, t(351) = 6.62, P < .001$, and negatively by SIS2, $\beta = -0.185, t(351) = -5.36, P < .001$.

For women, significant linear regression models were found for sexual compulsion, $F(6, 408) = 21.22, P < .001, R^2 = 0.232$, and sociosexual orientation, $F(6, 406) = 29.96, P < .001, R^2 = 0.284$. SES was a significant, positive predictor for both sexual compulsivity, $\beta = 0.356, t(408) = 7.99, P < .001$, and sociosexual orientation, $\beta = 0.338, t(406) = 7.96, P = .048$. SIS2 was a significant, negative predictor for sexual compulsivity, $\beta = -0.175, t(408) = -3.57, P < .001$, and sociosexual orientation, $\beta = -0.201, t(406) = -4.37, P < .001$.

Table 6. Multiple regression models for sexual compulsion and sociosexual orientation

	Men		Women	
	B	(β)	B	(β)
Sexual compulsion				
Age	0.006	(0.059)	-0.001	(-0.009)
Sexual orientation	-0.028	(-0.017)	0.136	(0.067)
Marital status	-0.048	(-0.039)	-0.147	(-0.107)
SES	0.081	(0.400)*	0.071	(0.356)*
SIS1	0.027	(0.096)	-0.018	(-0.071)
SIS2	-0.027	(-0.104)	-0.043	(-0.175)*
Sociosexual orientation				
Age	0.063	(0.272)*	0.029	(0.104)
Sexual orientation	0.738	(0.220)*	0.381	(0.071)
Marital status	-0.559	(-0.191)*	-0.653	(-0.179)*
SES	0.178	(0.404)*	0.177	(0.338)*
SIS1	0.024	(0.001)	-0.057	(-0.083)
SIS2	-0.185	(-0.370)*	-0.131	(-0.201)*

*P < .008 (Bonferroni correction: .05 / 6)

DISCUSSION

The goal of this study was to validate the French-Canadian version of the SIS/SES-SF for predicting sexual functioning and behaviors for men and women. The psychometric properties of the scales were good, with each factor contributing to the prediction of sexual functions, sexual compulsion, and sociosexual orientation of men and women, above and beyond the confounding effects of age, sexual orientation, and marital status. Taken together, these results support the cross-cultural transferability of the SIS/SIS-SF and the DCM.

Using ESEM, we were able to replicate the original three-factor structure from Carpenter et al¹⁰, providing evidence that the SIS/SES-SF measures the same construct postulated by the DCM. While the internal consistency of the scales was somewhat low for men (ie, < .70 for the SIS1 and SIS2), these indices were comparable to those of a previous study²¹. As internal consistency is affected by the number of items in a scale, lower scores are to be expected. Yet, the temporal stability of the scales was sufficiently high to ensure confidence in their reliability. Data fit for our sample was good, with indices better than those found in the German²¹ and Spanish³⁵ translations (data fit was not reported in Carpenter et al¹⁰). This could be explained by our choice of estimator for the analysis, WLSMV being recommended for Likert-type scale with less than 5 response categories,³⁶ It could also be explained by the choice of analysis, as ESEM, contrary to CFA, more realistically enables item cross-loadings using an oblique rather than an orthogonal rotation.³⁷

Analysis of measurement invariance showed that only the general structure of the SIS/SES-SF was the same between men and women, meaning that direct comparison of scores of the scales cannot be made. This result is (partly) surprising as Moyano and Sierra³⁵ reported strict invariance and Rettenberger et al²¹ partial scalar invariance. This limited invariance found in our study could be the result of using ESEM, as a more complex data structure (ie, with item cross-loadings) is necessarily harder to replicate in different subgroups. Inspection of modification indices suggest that differences between men and women were among cross-loadings. Using ESEM also limited our capacity to test for partial measurement invariance in our samples, as freeing factor

loadings is impossible with a factor rotation. Now that the factor structure has been confirmed in a sample of French-Canadian men and women, other analytical tools that are more flexible for invariance measurement testing could be used to push further the analysis.

This result of limited measurement invariance could be taken as further proof that the SIS/SES is unable to capture the full range of inhibitory cues for women's sexual response.^{8,12} Yet, our results indicate that the SIS/SES-SF is relevant in understanding sexual functioning and behaviors not only for men, but also for women. High SES and low SIS2 were predictive of greater sexual compulsivity and sociosexual orientation. Contrary to Quinta Gomes et al,¹² who found significant results only for the SES in women, the SIS1 was a significant negative predictor of women's sexual desire, sexual arousal, lubrication, and pain in our sample. These discrepancies between study results might be explained by an age difference, as our sample was significantly younger than Quinta Gomes et al¹² sample. It might be that relationship and emotional intimacy are more important for older women, although in our sample the SIS1 was a significant predictor above and beyond the effect of age, relationship status, and sexual preferences. It is possible that these differences could be explained by cultural differences between French-Canadian women and women from Portuguese or English-speaking countries. This question could be answered in an international study by testing measurement invariance on the SIS/SES between women from different countries and by comparing the predictive power of the scales for sexual functioning.

Limits and Future Directions

This study is not without limitations. First, although we aimed to recruit individuals from the general population, the final sample was mostly composed of college students. Our recruitment methodology was more effective in reaching younger people, which was not helped by the inclusion of individuals aged between 18 and 45 to ensure the validity of our use of the sexual functioning questionnaires. Generalization toward individuals who are not relatively young and highly educated should be done with caution. Also, while we adapted our questionnaires and our recruitment methods to include non-binary individuals, sexual diversity, at least in terms of gender identity, was limited in our sample. It could be interesting to conduct a study specifically aimed toward understanding if and how the DCM can be generalized to nonbinary and transgendered individuals. Finally, while the IIEF and FSFI are the golden standards for the screening of sexual dysfunction, interpretation of the subscale scores is controversial, as some are composed of only two or three items. Future research regarding the link between the SIS/SES-SF and specific sexual dysfunctions should use more thorough questionnaires or clinical interviews to ensure that the relevant dimensions of sexual function are properly evaluated, which would increase confidence in the utility of the DCM.

CONCLUSION

By replicating the three-factor solution of the SIS/SES-SF, we were able to validate the use of the SIS/SES-SF for studying sexual functioning and behaviors in French-Canadian men and women. Our results converge with a large growing body of literature showing the validity and utility of the DCM in understanding sexual dysfunctions and behaviors in yet another culture. While the measurement invariance was limited between men and women, successful predictions of relevant constructs suggest that both clinicians and researchers could benefit from including the questionnaire and the DCM into their work.

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STATEMENT OF AUTHORSHIP

Kévin Nolet: Conception and Design, Acquisition of Data, Analysis and Interpretation of Data, Drafting the Article, Revising It for Intellectual Content, Final Approval of the Completed Article; Sophie Bergeron: Conception and Design, Acquisition of Data, Revising It for Intellectual Content, Final Approval of the Completed Article; Stéphane Guay: Analysis and Interpretation of Data, Revising It for Intellectual Content, Final Approval of the Completed Article.

REFERENCES

1. Bancroft J, Janssen E. The dual control model of male sexual response: a theoretical approach to centrally mediated erectile dysfunction. *Neurosci Biobehav Rev* 2000;24:571-579.
2. Bancroft J, Graham CA, Janssen E, et al. The dual control model: current status and future directions. *J Sex Res* 2009;46:121-142.
3. Janssen E, Bancroft J. The dual control model: the role of sexual inhibition & excitation in sexual arousal and behavior. In: Janssen E, editor. *The psychophysiology of sex*. Bloomington (IN): Indiana University press; 2007.
4. Janssen E, Vorst H, Finn P, et al. The sexual inhibition (SIS) and sexual excitation (SES) scales: I. measuring sexual inhibition and excitation prones in men. *J Sex Res* 2002;39:114-126.
5. Bancroft J, Janssen E, Strong D, et al. Sexual risk-taking in gay men: the relevance of sexual arousability, mood, and sensation seeking. *Arch Sex Behav* 2003;32:555-572.
6. Bancroft J, Janssen E, Carnes L, et al. Sexual activity and risk taking in young heterosexual men: the relevance of sexual arousability, mood, and sensation seeking. *J Sex Res* 2004;41:181-192.
7. Carpenter D, Janssen E, Graham C, et al. Women's scores on the sexual inhibition/sexual excitation scales (SIS/SES): gender similarities and differences. *J Sex Res* 2008;45:36-48.

8. Graham CA, Sanders SA, Milhausen RR. The sexual excitation/sexual inhibition inventory for women: psychometric properties. *Arch Sex Behav* 2006;35:397–409.
9. Milhausen RR, Graham CA, Sanders SA, et al. Validation of the sexual excitation/sexual inhibition inventory for women and men. *Arch Sex Behav* 2010;39:1091–1104.
10. Carpenter DL, Janssen E, Graham CA, et al. The sexual inhibition/sexual excitation scales-short form (SIS/SES-SF). In: Fisher TD, Davis CM, Yarber WL, editors. Handbook of sexuality-related measures. Abingdon, United Kingdom: Routledge; 2011. p. 236–239.
11. Bancroft J, Carnes L, Janssen E, et al. Erectile and ejaculatory problems in gay and heterosexual men. *Arch Sex Behav* 2005;34:285–297.
12. Quinta Gomes AL, Janssen E, Santos-Iglesias P, et al. Validation of the sexual inhibition and sexual excitation scales (SIS/SES) in Portugal: assessing gender differences and predictors of sexual functioning. *Arch Sex Behav* 2018;47:1721–1732.
13. Sarin S, Amsel R, Binik YM. How hot is he? A psychophysiological and psychosocial examination of the arousal patterns of sexually functional and dysfunctional men. *J Sex Med* 2014;11:1725–1740.
14. Velten J. The dual control model of sexual response: relevance of sexual excitation and sexual inhibition for sexual function. *Curr Sex Health Rep* 2017;9:90–97.
15. Gaither GA, Sellbom M. The sexual sensation seeking scale: reliability and validity within a heterosexual college student sample. *J Pers Assess* 2003;81:157–167.
16. Winters J, Christoff K, Gorzalka BB. Dysregulated sexuality and high sexual desire: distinct constructs? *Arch Sex Behav* 2010;39:1029–1043.
17. Rettenberger M, Klein V, Briken P. The relationship between hypersexual behavior, sexual excitation, sexual inhibition, and personality traits. *Arch Sex Behav* 2016;45:219–233.
18. Walton MT, Cantor JM, Lykins AD. An online assessment of personality, psychological, and sexuality trait variables associated with self-reported hypersexual behavior. *Arch Sex Behav* 2017;46:721–733.
19. Muise E, Milhausen RR, Cole SL, et al. Sexual compulsivity in heterosexual married adults: The role of sexual excitation and sexual inhibition in individuals not considered “high-risk. *Sex Addict Compulsivity* 2013;20:192–209.
20. Granados MR, Salinas JM, Sierra JC. Psychometric properties of the Spanish version of the sexual inhibition/sexual excitation scales for men. *Arch Sex Behav* 2018;47:783–796.
21. Rettenberger M, de Albuquerque Camarao B, Breiling L, et al. A validation study of the German version of the sexual inhibition/sexual excitation scales-short form. *Arch Sex Behav* 2019;48:2553–2563.
22. Panzeri M, Dèttore D, Altoe G, et al. Factor structure of the Italian sexual inhibition/excitation (SIS/SES) scales. *Sexologies* 2008;17.
23. Varjonen M, Santtila P, Hoglund M, et al. Genetic and environmental effects on sexual excitation and sexual inhibition in men. *J Sex Res* 2007;44:359–369.
24. Nowosielski K, Kurpisz J, Kowalczyk R, et al. Sexual inhibition and sexual excitation scales in men: psychometric properties of a Polish adaptation. *Arch Sex Behav* 2020:1–13.
25. Malavige LS, Wijesekara PN, Jayaratne SD, et al. Linguistic validation of the sexual inhibition and sexual excitation scales (SIS/SES) translated into five South Asian languages: Oxford sexual dysfunction study (osds). *BMC Res Notes* 2013;6:550.
26. Rosen RC, Riley A, Wagner G. The international index of erectile function (IIEF): a multidimensional scale for assessment of erectile dysfunction. *Urology* 1997;49:822–830.
27. Rosen RC, Brown J, Heiman S, et al. The female sexual function index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther* 2000;26:191–208.
28. Kalichman SC, Rompa D. Sexual sensation seeking and sexual compulsivity scales: validity, and predicting HIV risk behavior. *J Pers Assess* 1995;65:586–601.
29. Kalichman SC, Rompa D. The sexual compulsivity scale: further development and use with HIV-positive persons. *J Pers Assess* 2001;76:379–395.
30. Penke L. Revised sociosexual orientation inventory. In: Fisher TD, Davis CM, Yarber WL, Davis SL, editors. Handbook of sexuality-related measures. 3rd edn New York: Routledge; 2011. p. 622–625.
31. Marsh HW, Hau KT, Wen Z. In search of golden rules: comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Struct Equ Modeling* 2004;11:320–341.
32. Marsh HW, Muthén B, Asparouhov T, et al. Exploratory structural equation modeling, integrating CFA and EFA: application to students' evaluations of university teaching. *Struct Equ Modeling* 2009;16:439–476.
33. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. *Struct Equ Modeling* 2007;14:464–504.
34. Cheung GW, Rensvold RB. Evaluating goodness-of-fit indexes for testing measurement invariance. *Struct Equ Modeling* 2002;9:233–255.
35. Moyano N, Sierra JC. Validación de las escalas de inhibición sexual/excitación sexual-forma breve (SIS/SES-SF). *Terapia psicológica* 2014;32:87–100.
36. Beauducuel A, Herzberg PY. On the performance of maximum likelihood versus means and variance adjusted weighted least squares estimation in CFA. *Struct Equ Modeling* 2006;13:186–203.
37. Reise SP, Waller NG, Comrey AL. Factor analysis and scale revision. *Psychol Assess* 2000;12:287–297.

SUPPLEMENTARY MATERIALS

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