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Insecure Attachment and Sexual Satisfaction: A Path Analysis Model Integrating Sexual Mindfulness, Sexual Anxiety, and Sexual Self-Esteem

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ABSTRACT

This study examines the intermediary role of three variables (sexual mindfulness, sexual anxiety, and sexual self-esteem) in a path analysis model to explain the association between insecure attachment and sexual satisfaction. A community sample of 543 adults completed an online survey. Results supported our hypothesized integrative model, which explained 44.1% of the variance in sexual satisfaction and presented satisfactory fit indices. This study suggests that the association between attachment insecurities and lower sexual satisfaction could be partially explained by a proximal association with lower sexual mindfulness, which emphasizes the relevance of examining sexual mindfulness during the screening and treatment of people presenting low sexual satisfaction.


Introduction

Sexual satisfaction has been empirically defined as a strong indicator of relationship satisfaction (Butzer & Campbell, 2008; Byers, 2005; McNulty, Wenner, & Fisher, 2016; Vowels & Mark, 2020) and quality of life (Davison, Bell, LaChina, Holden, & Davis, 2009; Flynn et al., 2016). Yet, low sexual satisfaction and sexual difficulties are common experiences within the adult population (Graham et al., 2020; Lewis et al., 2010; Wang et al., 2015). For instance, US national surveys indicate that about 30% of adults report being unsatisfied with their sex lives (Heiman et al., 2011; Smith et al., 2011). While a growing body of evidence suggests that attachment insecurities are associated with lower sexual satisfaction (e.g., Birnbaum, 2010; Butzer & Campbell, 2008; Mark, Vowels, & Murray, 2018), some authors have recently recommended investigating the specific psychosexual mechanisms that underlie these associations (Brassard, Dupuy, Bergeron, & Shaver, 2015; Gewirtz-Meydan & Finzi-Dottan, 2018).

Based on prior empirical evidence and theory, three key psychosexual variables (i.e., sexual mindfulness, sexual anxiety, and sexual self-esteem) were retained as hypothesized mechanisms explaining the associations between insecure attachment and sexual satisfaction. Studies found significant negative associations between adult attachment insecurities (i.e., anxiety and avoidance) and mindfulness (for a review, see Stevenson, Emerson, & Millings, 2017), while other data supports that heightened mindfulness skills are linked with increased sexual satisfaction (for reviews, see Dussault, Fernet, & Godbout, 2020; Jaderek & Lew-Starowicz, 2019; Stephenson &

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Kerth, 2017), suggesting that mindfulness may play a role in the association between attachment insecurities and sexual satisfaction. While past research mainly explored dispositional mindfulness in relation to sexual wellbeing (e.g., Khaddouma, Gordon, & Bolden, 2015; Laurent, Laurent, Hertz, Egan-Wright, & Granger, 2013; Newcombe & Weaver, 2016), here we focus on sexual mindfulness - a sub-type of state mindfulness referring to the ability to remain mindful during sexual encounters - which appears more closely tied to sexual satisfaction than general mindfulness (Leavitt, Lefkowitz, & Waterman, 2019). Moreover, recent data suggests that lower levels of sexual mindfulness are associated with higher levels of sexual anxiety (Leavitt et al., 2020) and lower levels of sexual self-esteem (Leavitt et al., 2019), which are both associated with lower levels of sexual satisfaction (Brassard et al., 2015; Lafortune et al., 2021). In sum, the literature suggests a possible sequential model in which insecure attachment contributes to low sexual mindfulness, which in turn would be associated with higher sexual anxiety and lower sexual self-esteem, contributing to lower sexual satisfaction. Yet, this hypothesis remains to be empirically tested. Examining sexual mindfulness specifically, an emerging concept in the field of human sexuality (Leavitt et al., 2019), may provide precious insight into its role in sexual wellbeing and its relevance during clinical assessment and treatment.

Attachment and sexual satisfaction

Attachment theory has grown to become a classic and robust conceptual framework that is widely used to understand romantic relationships and sexuality (Cassidy & Shaver, 2015). At its core, the development of an attachment system begins during the first year of infancy with the primary caregiver acting as the main attachment figure (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1982). In adulthood, attachment figures usually evolve toward romantic partners (Hazan & Shaver, 1987). Adult attachment can be conceptualized through two continuous dimensions: attachment anxiety and avoidance (Brennan, Clark, & Shaver, 1998), where insecure attachment is defined by heightened levels of attachment anxiety and/or avoidance. Anxious attachment is characterized by the internalization of negative representations of oneself as unworthy of love, and by a deep-rooted fear of being abandoned or rejected by one's partner (Brennan et al., 1998). When anxious individuals perceive a potential threat to their relationship, their attachment system tends to be hyperactivated, which drives the use of strategies such as constantly seeking reassurance and closeness from their partner (Mikulincer & Shaver, 2007). The hyperactivation of the attachment system also translates into hypervigilance toward one's partner's availability, commitment, and interest (Mikulincer & Florian, 1998), reducing one's attentional awareness and regulation (Mikulincer & Shaver, 2003). Conversely, avoidant attachment is characterized by an internalized negative perception of others and discomfort toward intimacy (Brennan et al., 1998), both emotional and physical (Shaver & Hazan, 1988), and a heightened need for independence. When avoidant individuals perceive possible threats in their relationship, deactivation strategies, such as an elevated need for distance from a partner or the suppression of emotions, are used to reduce vulnerability (Mikulincer & Shaver, 2007).

An insecure attachment system may impact multiple relationship domains, including sexual satisfaction (Gewirtz-Meydan & Finzi-Dottan, 2018; Mark et al., 2018; Péloquin, Brassard, Lafontaine, & Shaver, 2014; Stefanou & McCabe, 2012). For instance, insecure attachment may lead to negative thoughts and distressing feelings about sexual encounters (e.g., vigilance toward the partner's sexual interest, communion-related fears during sexual intercourse), leading to lower levels of sexual satisfaction (Birnbaum, 2010; Brassard et al., 2015). Therefore, distinct patterns have been highlighted in function of the type of insecure attachment (i.e., avoidant or anxious; Birnbaum, 2015). Cognitions and emotions typical of anxiously attached persons (e.g., fear of rejection, heightened expectations of closeness with the romantic partner) tend to hinder their ability to experience sexual encounters holistically (i.e., attention to erotic stimuli and bodily sensations), which in turn contributes to lower levels of sexual satisfaction (Birnbaum, 2007; Davis et al., 2006). For avoidant individuals, sexual encounters can be experienced as

somewhat unpleasant, since uneasy feelings of estrangement, dependence, and alienation tend to be activated or anticipated (Birnbaum, 2015), resulting in distressing mental states hindering their ability to appreciate physical intimacy and experience satisfactory partnered sex.

If attachment insecurities seem closely related to sexual satisfaction, the psychosexual mechanisms that explain this association have yet to be identified (Brassard et al., 2015). Prior evidence suggests that the link between insecure attachment and sexual satisfaction might be explained by a reduced disposition toward mindfulness during sex, increased anxiety (e.g., about rejection, intimacy), and self-worth concerns. The next section will review the scientific literature on attachment and sexual satisfaction with respect to their associations with sexual mindfulness, sexual anxiety, and sexual self-esteem.

Sexual mindfulness, anxiety, and self-esteem

Mindfulness is rooted in religious and spiritual traditions (e.g., Buddhism, Taoism) and is defined as the self-regulation of awareness and the nonjudgemental acceptance of one's immediate experiences (Kabat-Zinn, 2009). The term mindfulness has been used to describe different concepts, from a contemplative practice to a metacognitive state (Stevenson et al., 2017). In the present article, mindfulness is conceptualized as a psychological disposition (i.e., dispositional mindfulness). Attachment theory provides an understanding of how incompatible both attachment insecurity dimensions (i.e., anxiety and avoidance) are with dispositional mindfulness (Stevenson et al., 2017). Specifically, mindfulness encompasses an accepting stance of one's own thoughts and feelings via direct observation of one's present internal state. Conversely, anxious attachment entails negative thoughts and emotions such as perceptions of unworthiness, hypervigilance to signs of rejection, and increased levels of anticipation and rumination (Mikulincer & Florian, 1998). As for avoidant attachment, it is marked by the suppression and avoidance of intimacy-related thoughts and feelings (Mikulincer & Shaver, 2003). Both of these attachment styles are thus incompatible with being mindfully aware of the present moment as it unfolds, without judgment. Previous studies support that attachment insecurities (both anxiety and avoidance) are linked to lessened mindfulness dispositions (Goodall, Trejnowska, & Darling, 2012; Snyder, Shapiro, & Treleaven, 2012; Stevenson et al., 2017). Also, since mindfulness involves a state of nonjudgment and non-reactivity, it plays an important role in emotional self-regulation (Davis & Hayes, 2011; Karremans, Schellekens, & Kappen, 2017). Consequently, the hyperactivation and deactivation of the attachment system among insecure-attachment individuals tend to impair cognitive and emotional regulation capacities regarding distressing mental states (Orehek, Vazeou-Nieuwenhuis, Quick, & Weaverling, 2017; Pallini et al., 2018). As sexual mindfulness disposition promotes the awareness and acceptance of thoughts and feelings within sexual contexts, it may help bring attention to the physical sensations and erotic perceptions that lead to increased pleasure, sexual arousal, and orgasm (Adam, Geonet, Day, & de Sutter, 2015; Silverstein, Brown, Roth, & Britton, 2011). Unsurprisingly, individuals with higher dispositional mindfulness tend to experience greater sexual functioning (Arora & Brotto, 2017; Silverstein et al., 2011) and satisfaction (Khaddouma et al., 2015; Leavitt et al., 2019; Pepping, Cronin, Lyons, & Caldwell, 2018). Even though previous works have highlighted strong associations between dispositional mindfulness and sexual wellbeing (e.g., Atkinson, 2013; Davis & Hayes, 2011), research is still in its early stages when it comes to studying mindfulness in sexual contexts (i.e., sexual mindfulness; Adam et al., 2015; Leavitt et al., 2019). Individuals that are mindful during their daily routine can still face barriers within sexual contexts, such as fixating on sexual goals (e.g., orgasm), self-criticizing, or being sexually anxious (Barnes, Brown, Krusemark, Campbell, & Rogge, 2007; Leavitt et al., 2019). Recent data suggest that sexual mindfulness appears to be more closely tied to sexual satisfaction than dispositional mindfulness (Leavitt et al., 2019). Sexual mindfulness might potentially explain the effect of attachment on sexual satisfaction, yet no studies have examined an integrative model depicting the relationships between attachment, sexual mindfulness, and sexual satisfaction. Given prior data on sexual

mindfulness (Leavitt et al., 2019, 2020), sexual anxiety and sexual self-esteem also appear to be key variables to examine in such a model.

Sexual anxiety is defined as the tendency to experience worry, discomfort, or fear when exposed to sexual contexts or cues (Fisher, White, Byrne, & Kelley, 1988; Snell, Fisher, & Walters, 1993). Sexual anxiety might explain the link between attachment insecurities and sexual satisfaction. In fact, individuals with higher attachment insecurities tend to report more sexual anxiety (Brassard et al., 2015; Davis et al., 2006), as they refer to experiences of estrangement, apprehension, or intrusive thoughts while in romantic relationships (Birnbaum, Reis, Mikulincer, Gillath, & Orpaz, 2006), which may lead to attentional focus on sexual performance and cognitive distractions, at the expense of full attention toward erotic cues (Nelson & Purdon, 2011; Nobre & Pinto-Gouveia, 2009). Theoretical literature (e.g., Brotto, 2013) suggests that low mindfulness skills may result in heightened difficulties to regulate anxiety during sexual interactions, whereas empirical data support that mindfulness is associated with reduced performance anxiety and stress during sexual encounters (Baker & Absenger, 2013; Brotto & Goldmeier, 2015; Dunkley, Goldsmith, & Gorzalka, 2015). While studies exploring the relationship between sexual mindfulness and sexual anxiety in adults are lacking, Leavitt et al. (2020) have found that exhibiting lower mindfulness in everyday life and within sexual encounters is linked with experiencing more sexual anxiety among adolescents. The ability to self-regulate awareness and remain non-judgmental during sex may be particularly important as sexual mindfulness may reduce constant anxiety-provoking rumination (Leavitt et al., 2019). Finally, elevated sexual anxiety may lead to lower sexual desire (Brassard et al., 2015; Nelson & Purdon, 2011), increased sexual distress (Dang, Northey, Dunkley, Rigby, & Gorzalka, 2018), and lower sexual satisfaction (Bigras, Daspe, Godbout, Briere, & Sabourin, 2017; Brassard et al., 2015; Lafortune et al., 2021).

Sexual self-esteem refers to the dispositional tendency to be confident with one's sexual skills and value as a sexual partner (Snell et al., 1993). Previous studies have shown that attachment insecurities are negatively related to sexual self-esteem (Brassard et al., 2015; Gentzler & Kerns, 2004; Mikulincer & Shaver, 2007). One explanation might be that individuals with attachment insecurities tend to have more negative sexual self-schemas (Andersen & Cyranowski, 1994; Shafer, 2001), such as seeing themselves as less physically attractive (Bogaert & Sadava, 2002) or being uncertain about their ability to satisfy their own or their partner's sexual needs (Brassard et al., 2015; Tracy, Shaver, Albino, & Cooper, 2003). During sexual interactions, insecure individuals might struggle to regulate their insecure attachment-related perceptions and cognitive processes through the observation, recognition, and acceptance of distressing thoughts and feelings (i.e., sexual mindfulness). Moreover, as sexual mindfulness relates to the ability to be self-aware and nonjudgmental of oneself during sexual experiences, it is likely that this process may decrease rumination, and therefore, harsh self-evaluations during sexual interactions (Leavitt et al., 2020). Supporting this, recent studies suggest that increased sexual mindfulness is related to greater sexual self-esteem (Leavitt et al., 2019, 2020). Finally, an expanding body of research supports the associations between sexual self-esteem and greater relational well-being and sexual satisfaction (e.g., Brassard et al., 2015; Ménard & Offman, 2009).

In summary, as insecurely attached individuals tend to exhibit lower mindfulness skills, they may experience greater difficulties in regulating negative and distracting emotions such as distress and anxiety when exposed to sexual contexts or cues (i.e., sexual anxiety), as well as exhibit lower sexual self-esteem, which may lead to reduced sexual satisfaction.

Research aims and hypotheses

The present study's goal was to explore the potential role of sexual mindfulness, sexual self-esteem, and sexual anxiety in the associations between insecure attachment and sexual satisfaction. Based on theory and existing empirical evidence, we hypothesized direct and indirect associations between the aforementioned variables whereby insecure attachment (i.e., attachment anxiety and avoidance) would be negatively associated with sexual satisfaction, first through decreased sexual

mindfulness, and then through higher levels of sexual anxiety and lower levels of sexual self-esteem. In order to examine the validity of this model, we posited the following hypotheses:

- H₁ Both anxious and avoidant attachment will be negatively associated with sexual satisfaction.
- H₂ Both anxious and avoidant attachment will be negatively associated with sexual mindfulness.
- H₃ Sexual mindfulness will be negatively associated with sexual anxiety, and positively with sexual self-esteem and sexual satisfaction.
- H₄ Higher sexual anxiety and lower sexual self-esteem will be linked to lower sexual satisfaction.
- H₅ A sequential model would explain the link between both anxious and avoidant attachment and sexual satisfaction first through sexual mindfulness, and then through sexual anxiety and sexual self-esteem.

Given that important sociodemographic variables (e.g., gender, age, relationship status) were found to be associated with sexual satisfaction and related outcomes in the literature (e.g., Carter et al., 2020; Fallis, Rehman, Woody, & Purdon, 2016; Heiman et al., 2011; Siann, 2013), we examined their effects as covariates.

Method

Participants and procedure

A non-probabilistic sample of 652 French-Canadians aged 18 to 69 years old ($M = 36.24$, $S.D. = 11.63$) were recruited from the general population from March to May of 2020. Of the 652 participants who started the survey, 5% ($n = 33$) exited after completing the consent form and 11.6% ($n = 76$) dropped out at various points of the survey after having completed the sociodemographic section, leaving a final analytical sample of 543 participants (60% women). Drop-outs did not significantly differ from the remaining sample on age, gender, education level, and relationship status. The final sample's sociodemographic characteristics are presented in Table 1.

Participants were recruited on social media (i.e., *Facebook* and *Instagram*) to complete an anonymous online survey on sexual well-being hosted on Qualtrics. Targeted advertising strategies were deployed on *Facebook* to increase the representativeness of certain subgroups (e.g., men, 18-25-year-old adults). In order to meet the inclusion criteria for the study, participants had to be at least 18 years old and have sufficient knowledge of French to complete the survey. The questionnaire took about 20 to 30 minutes to complete. Participants completing at least 70% of the survey were eligible to win a gift-card (value ranging from \$50 to \$200 CAD). The study was approved by the Université du Québec à Montréal's Institutional Ethics Review Board.

Measures

A sociodemographic questionnaire was used to gather information on participants' characteristics (e.g., age, gender, sexual orientation, education, income, relationship status, etc.).

Experiences in Close Relationships Questionnaire-12 (ECR-12)

The French short version of the Experiences in Close Relationships Questionnaire-12 (ECR-12; Lafontaine et al., 2016) was used to assess attachment patterns in romantic relationships. The ECR-12 is a 12-item scale measuring two dimensions of attachment, namely attachment avoidance (6 items) and anxiety over abandonment (6 items). Participants rated their agreement to each item on a 7-point Likert scale ranging from 1 (*disagree strongly*) to 7 (*agree strongly*). Mean scores ranged from 1 to 7 on both subscales. Lower scores on both dimensions indicate more secure attachment, and higher scores on either anxious or avoidant dimensions indicate insecure attachment. Both subscales showed good internal consistency in previous samples (e.g., $\alpha = .79$

Table 1. Sociodemographic characteristics.

Characteristics	Participants (%)
Gender identity	
Women	60.2
Men	35.2
Other (e.g., trans, non-binary)	4.7
Sexual orientation	
Heterosexual	70.9
Gai / Lesbian	9.8
Bisexual / Pansexual	14.1
Questioning	2.4
Other (e.g., asexual)	2.7
Occupation	
Student	23.8
Worker	59.7
Unemployed	4.8
Other (e.g., retired)	11.8
Education	
Primary school / High school	12.3
College / Professional	39.8
Undergraduate	33.1
Graduate	14.7
Annual income	
CAD\$19,999 or less	22.0
CAD\$20,000 - CAD\$39,999	23.3
CAD\$40,000 - CAD\$59,999	21.6
CAD\$60,000 or more	33.3
Relationship status	
Single	31.5
Relationship with a regular partner	25.3
Common-law partnership/cohabiting	25.6
Married	12.4
Other (e.g., divorced)	5.2

for attachment avoidance and .87 for anxiety over abandonment; Lafontaine et al., 2016); alpha coefficients from the present study are presented in Table 2.

Sexual Mindfulness Measure (SMM)

The Sexual Mindfulness Measure (SMM; Leavitt et al., 2019; $\alpha = .70-.78$) is a 7-item scale based on the classic Five Facet Mindfulness Questionnaire (Baer et al., 2008), a validated 39-item scale measuring five dimensions of mindfulness. The SMM comprises two distinct subscales, awareness (4 items) and nonjudgement of experience (3 items), each respectively assessing these two mindfulness skills during sexual experiences. Participants indicated the extent to which they

Table 2. Means, standard deviations, skewness, kurtosis, cronbach's alphas, and correlation coefficients.

Variables	<i>M</i>	<i>SD</i>	α	Skewness	Kurtosis	1	2	3	4	5	6	7
1. Anxious Attachment	4.47	1.51	.88	-.42	-.50	—	0.03	-.03	-.33***	.28***	-.20***	-.10*
2. Avoidant Attachment	2.85	1.30	.86	.54	-.26	—	-.29***	-.16***	.26***	-.30***	-.43***	
3. Sexual Mindfulness / Awareness	14.44	3.40	.80	-.46	.04	—	—	.09*	-.29***	.50***	.41***	
4. Sexual Mindfulness / Non-Judgment	10.10	3.02	.75	-.34	-.55	—	—	—	-.50***	.34***	.28***	
5. Sexual Anxiety	6.15	5.66	.90	.82	-.44	—	—	—	—	-.50***	-.54***	
6. Sexual Self-esteem	10.76	5.35	.93	-.28	-.75	—	—	—	—	—	.50***	
7. Sexual Satisfaction	25.35	6.48	.90	-.60	.05	—	—	—	—	—	—	

Note.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

experienced mindfulness during sexual encounters (e.g., *I pay attention to sexual sensations*) on a 5-point scale ranging from 1 (*never or rarely true*) to 5 (*very often or always true*). Summed scores ranged from 4 to 20 on the awareness subscale, and from 3 to 15 on the nonjudgment subscale, with higher scores reflecting greater sexual mindfulness. For the purpose of this study, we rigorously translated the English version of the SMM into French using the back-translation method (Vallerand, 1989), and treated the two components of the SMM (i.e., awareness and nonjudgment) as distinct variables in the tested model.

Multidimensional Sexuality Questionnaire (MSQ)

Two 5-item subscales of the Multidimensional Sexuality Questionnaire (MSQ; Snell et al., 1993; translated into French by Ravart, Trudel, & Turgeon, 2000) were used to measure sexual anxiety and sexual self-esteem. Participants rated each item on a Likert scale ranging from 1 (*not at all characteristic of me*) to 5 (*very characteristic of me*). Items included *"I feel anxious when I think about the sexual aspects of my life"* and *"I am confident about myself as a sexual partner"*. Summed scores ranged from 4 to 20 on each subscale. Higher sexual self-esteem scores reflect greater sexual self-esteem, whilst higher sexual anxiety scores indicate an increased propensity to experience anxiety in sexual contexts. Both subscales showed satisfactory internal consistency in previous samples (e.g., $\alpha = .77$ for sexual anxiety and $.84$ for sexual self-esteem; Brassard et al., 2015).

Global Measure of Sexual Satisfaction (GMSEX)

The French version of the Global Measure of Sexual Satisfaction (GMSEX; Bois, Bergeron, Rosen, McDuff, & Grégoire, 2013; $\alpha = .92$) was used to assess overall sexual satisfaction (i.e., the subjective evaluation of the positive and negative aspects of one's sexual relationship, and subsequent affective response to this evaluation; Lawrance & Byers, 1992). Participants rated their sexual relationships on five 7-point bipolar scales: bad-good, unpleasant-pleasant, negative-positive, unsatisfying-satisfying, and worthless-valuable. Mean scores ranged from 5 to 35, with lower scores reflecting lower sexual satisfaction.

Data analysis

Preliminary analyses

Descriptive and correlational (Pearson) analyses were performed on SPSS v26 to examine the sample distribution, means, standard deviations, and associations between all variables included in the model (see Table 2). Cronbach's alphas were calculated to estimate each measure's internal consistency.

Path analyses

The hypothesized sequential mediation model was tested with path analyses using *Mplus*, version 8.4 (Muthén & Muthén, 1998–2017). Missing data were accounted for through the use of *Full Information Maximum Likelihood* (FIML). Little's (1988) Missing Completely at Random (MCAR) test was non-significant, $\chi^2[22] (N=543) = 22, p = .151$, which means that there was no evidence to suggest that the data were not MCAR. *Mplus* is robust to non-independence of observations through the use of the maximum likelihood estimator (MLR; Muthén & Muthén, 1998–2017). Model fit was tested by examining the following indices: the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), the Comparative Fit Index (CFI; Bentler & Bonett, 1980), the chi-square statistic and the ratio of chi-square to degrees of freedom (χ^2/df), and the Standardized Root Mean Residual (SRMR). Goodness-of-fit is determined by a combination of a non-statistically significant chi-square value, a CFI value of .90 or higher, RMSEA value below .06, SRMR value below .08, and a ratio of chi-square to degrees of freedom that is lower than three (Hu & Bentler, 1999; Kline, 2016; Ullman & Bentler, 2003).

Bootstrap 95% confidence intervals computing 10,000 samples (MacKinnon & Fairchild, 2009) were used in order to examine the indirect effects of sexual mindfulness (awareness and non-judgment), sexual anxiety, and sexual self-esteem between insecure attachment patterns and sexual satisfaction. We tested for both the magnitude and significance of direct effects (e.g., path coefficients from attachment avoidance to sexual satisfaction) and indirect effects (e.g., the product of the path coefficients from attachment anxiety to sexual mindfulness, from sexual mindfulness to sexual self-esteem and anxiety, from sexual self-esteem and anxiety to sexual satisfaction). For all tested pathways, standardized direct, specific indirect, total indirect and total effects were estimated. The initial model was first tested with no constraints and with all paths being tested. As per Garson's (2014) recommendations, non-significant paths were dropped one at a time and changes on estimates, coefficients, and model fit were meticulously noted. Moreover, alternative models were also tested (e.g., where sexual anxiety and sexual self-esteem precede sexual mindfulness), but were discarded as the resulting fit indices were poorer than those of the proposed model and did not concur with existing theoretical and empirical evidence.

Group comparisons (i.e., *t*-tests and one-way analyses of variance) and linear regressions were conducted to examine potential links between the sociodemographic variables (i.e., age, gender, sexual orientation, gender modality, education, income, and relationship status) and sexual satisfaction. The sociodemographic variables that were significantly correlated with sexual satisfaction were added as control variables in the model, and their effects on sexual satisfaction and model fit were examined (Muthén, 2010). Gender was also added as a control variable in the model in order to reduce its confounding effects and examine its associations with all estimated variables and its effect on the model's fit.

Results

Preliminary analyses

Descriptive statistics (i.e., means, standard deviations, skewness, kurtosis, and Cronbach's alphas) and bivariate correlations pertaining to the study variables are reported in Table 2. Correlation analyses supported our hypotheses regarding the relationships between the study variables (H_{1-4}), as statistically significant intercorrelations were found between insecure attachment and other psychosexual variables in the expected directions (i.e., negatively to sexual mindfulness, positively to sexual anxiety, negatively to sexual self-esteem, negatively to sexual satisfaction).

Group comparisons (i.e., *t*-test, one-way analysis of variance) and linear regressions between sexual satisfaction and sociodemographic variables revealed few significant associations. Results indicated that sexual satisfaction scores did not differ across gender (i.e., women, men, non-binary), gender modality (i.e., cisgender or transgender), sexual orientation (i.e., heterosexual, gay/lesbian, bisexual/pansexual, questioning, other), annual income, and education level. However, a significant negative association was observed between age and sexual satisfaction, $\beta = -.12$, $F(1, 539) = 8.07$, $p = .005$, $R^2 = .015$, with older participants reporting less sexual satisfaction, though with a small effect size. Data also revealed that sexual satisfaction scores differed across single and partnered participants, $t(512) = -6.02$, $p < .001$, with participants currently in a relationship reporting higher levels of sexual satisfaction ($M = 26.5$, $SD = 6.0$) than single participants ($M = 23.0$, $SD = 6.6$), with a moderate effect size ($\eta^2 = .07$). Sociodemographic variables that were significantly associated with sexual satisfaction (i.e., age and relationship status), as well as gender, were added as covariates in the hypothesized model to control their effects on the associations between insecure attachment, mediators, and sexual satisfaction in order to assess the generalizability of the model across participants.

Integrative path analysis model

The direct paths from attachment avoidance and attachment anxiety to sexual satisfaction were found to be significant, $\beta = -.43$, $SE = .04$, 95% CI $[-.51, -.35]$, $p < .001$ and $\beta = -.08$, $SE =$

.04, 95% CI [- .17, -.00], $p = .047$, respectively, showing negative associations (H_1). These direct paths explained 19.1% of the variance in sexual satisfaction.

Insecure attachment was significantly associated with sexual mindfulness (H_2), which in turn was significantly associated with sexual anxiety and sexual self-esteem (H_3), which in turn was associated with sexual satisfaction (H_4). Then, the sequential integrative model was tested in path analyses, adding sexual mindfulness, sexual anxiety, and sexual self-esteem, which fitted the data: CFI = 1.000, RMSEA = .000, CI [.000; .058], $\chi^2[4]=3.131$, $p = .536$, Ratio $\chi^2/df = .783$, SRMR = .013 (H_5). Only significant direct paths were included in the final model and presented in Figure 1. Confidence intervals and the significance levels of all significant indirect paths are detailed in Table 3. Overall, the model accounted for 44.1% of the variance in sexual satisfaction.

Avoidant attachment was sequentially linked to sexual satisfaction (see Table 3 for the indirect effects) through sexual mindfulness (both awareness and nonjudgment), sexual self-esteem, and sexual anxiety. The direct path from attachment avoidance to lower sexual satisfaction also remained significant, $\beta = -.24$, $SE = .04$, 95% CI [- .31, -.17], $p = .002$ (H_5). As such, heightened attachment avoidance was associated with lower sexual mindfulness (awareness and non-judgment), lower sexual self-esteem, higher sexual anxiety, and lower sexual satisfaction. The indirect effects through sexual mindfulness (awareness and nonjudgment), sexual anxiety, and sexual self-esteem were significant, with significant bootstrap confidence intervals.

Attachment anxiety was associated with lower sexual mindfulness (nonjudgment only), which in turn was associated with lower sexual self-esteem and higher sexual anxiety, which in turn were associated with lower sexual satisfaction. The direct path from attachment anxiety to sexual satisfaction became nonsignificant in this integrative model, $\beta = .05$, $SE = .04$, 95% CI [- .02, .13], $p = .142$, suggesting this relation is fully explained by the indirect effects (H_5). The indirect effects through sexual mindfulness (nonjudgment), sexual anxiety, and sexual self-esteem were significant, with significant bootstrap confidence intervals (see Table 3).

The models were re-run with the covariates (i.e., age, gender) to assess the model's generalizability across participant characteristics. Age was significantly associated with sexual satisfaction, $\beta = -.15$, $SE = .03$, 95% CI [- .22, -.09], $p < .001$. Gender was dichotomized (i.e., identified as woman = 0 or as man = 1), to control for its effect on each of the estimated variables. Other-identified individual (e.g., non-binary or fluid) were withdrawn for this particular analysis as the limited number of individuals limited the possibility to analyze and compare their results with sufficient statistical power. Finally, the model's invariance for relationship status (i.e., single versus partnered) was tested using the rescaled - 2 log likelihood difference test (Satorra & Bentler, 2010). The model with all paths constrained to be equal across groups was estimated and then compared with the baseline model (i.e., all paths allowed to be freely estimated). A chi-square difference test was used to determine whether decreases in model fit were significant

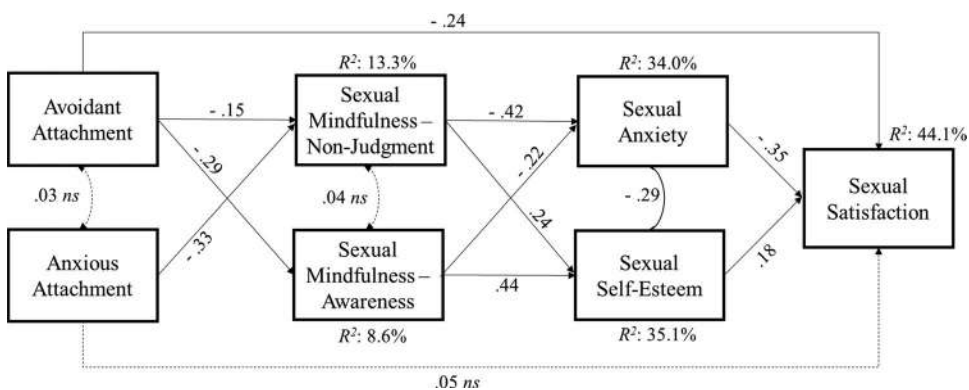


Figure 1. The mediating role of sexual mindfulness, sexual anxiety, and sexual self-esteem in the link between insecure attachment and sexual satisfaction. Note. All solid lines were significant at $p < .001$.

Table 3. Standardized estimates of indirect effects with 95% confidence intervals.

Indirect paths	Estimate (β)	Standard Error (<i>SE</i>)	95% CI	<i>p</i>
AV \rightarrow SA \rightarrow SS	-.044	.014	[-.072, -.016]	.002
AV \rightarrow SMA \rightarrow SS	-.044	.013	[-.070, -.017]	.001
AV \rightarrow SSE \rightarrow SS	-.025	.010	[-.044, -.006]	.010
AV \rightarrow SMA \rightarrow SA \rightarrow SS	-.022	.006	[-.034, -.010]	< .001
AV \rightarrow SMJ \rightarrow SA \rightarrow SS	-.022	.007	[-.035, -.008]	.002
AV \rightarrow SMA \rightarrow SSE \rightarrow SS	-.024	.007	[-.038, -.009]	.002
AV \rightarrow SMJ \rightarrow SSE \rightarrow SS	-.006	.003	[-.012, -.001]	.024
AX \rightarrow SA \rightarrow SS	-.046	.014	[-.072, -.019]	.001
AX \rightarrow SSE \rightarrow SS	-.018	.008	[-.034, -.002]	.029
AX \rightarrow SMJ \rightarrow SA \rightarrow SS	-.048	.009	[-.067, -.030]	< .001
AX \rightarrow SMJ \rightarrow SSE \rightarrow SS	-.014	.005	[-.024, -.004]	.006

Note. Standardized maximum likelihood estimates are presented. Bootstrap confidence intervals were all significant. AV = Attachment Avoidance, AX = Attachment Anxiety, SMA = Sexual Mindfulness Awareness, SMJ = Sexual Mindfulness non-Judgment, SA = Sexual Anxiety, SSE = Sexual Self-Esteem, SS = Sexual Satisfaction.

between models. Result of $\Delta\chi^2$ test was non-significant ($\Delta\chi^2 = 16,20$; $p = 0,369$), suggesting model invariance across relationship status (Putnick & Bornstein, 2016). Results also revealed that controlling for these variables did not change the significance nor the strength of the associations between the study variables, and did not affect model fit, with similar explained variance in sexual satisfaction (from 43.4% to 47.7%).

Discussion

The aim of the present study was to examine the direct and indirect associations between attachment and sexual satisfaction through sexual mindfulness, sexual anxiety, and sexual self-esteem in an adult sample from the general population. Results suggest that attachment insecurities are related to lower sexual satisfaction, both directly and indirectly. Indeed, part of this association could be attributed to lower sexual mindfulness, heightened sexual anxiety, and lower sexual self-esteem. By examining proximal associations with sexual mindfulness skills, our results went a step further than prior research, as previous models had not included mindfulness (e.g., Brassard et al., 2015; Davis et al., 2006; Péloquin et al., 2014; Timm & Keiley, 2011) or explored the role of dispositional rather than sexual mindfulness (e.g., Kimmes, Durtschi, & Fincham, 2017; McDonald et al., 2016; Vilarinho, 2017).

Analyses supported our hypotheses regarding the relationships between studied variables, as significant links were found between insecure attachment, intermediary variables, and sexual satisfaction in the expected directions, replicating previous findings (Brassard et al., 2015; Davis et al., 2006; Leavitt et al., 2019). Moreover, this study provides primary insight on the relationships between sexual mindfulness – an emerging and promising concept in sex research (Adam et al., 2015; Leavitt et al., 2019) – and insecure attachment and sexual anxiety among adults. Firstly, both higher levels of anxious and avoidant attachment appear to be negatively associated with sexual mindfulness, consistently with previous data on dispositional mindfulness (Stevenson et al., 2017), suggesting that sexual and dispositional mindfulness show similar patterns in relation to insecure attachment. Secondly, sexual mindfulness awareness and nonjudgment scores respectively have medium and strong negative associations with sexual anxiety, partially replicating findings among adolescents (Leavitt et al., 2020), but in an adult sample. Although preliminary, these findings support the idea that sexual mindfulness might play a role in decreasing ruminations, apprehensions, and, more broadly, anxious responses surrounding sexual interactions or cues (Leavitt et al., 2020).

Our findings suggest that the association between attachment anxiety and lower sexual satisfaction is explained by lower sexual mindfulness (nonjudgment), higher sexual anxiety, and lower sexual self-esteem. In other words, individuals who are more apprehensive of rejection from their partner and who hold more negative self-perceptions may be more likely to

be affected by intrusive and negative thoughts during sex, which then impair their sexual satisfaction. As anxiously attached individuals may experience distressful intrusive thoughts related to sexual encounters (Birnbaum et al., 2006), such as fear of rejection (Brennan et al., 1998) or of infidelity (Schachner & Shaver, 2002), or insecurities related to physical attractiveness (Bogaert & Sadava, 2002; Brassard et al., 2015), it is plausible that remaining in an accepting and nonjudgmental stance during sexual experiences might be challenging. Indeed, our data suggest that lower nonjudgment scores are in turn related to greater sexual anxiety and lower self-esteem, and in turn to lower sexual satisfaction, potentially because of a limited ability to experience pleasure-oriented sex due to apprehension and self-depreciation (e.g., Birnbaum, 2007; Dewitte, 2012; Leavitt et al., 2019). Along with previous data (Leavitt et al., 2019, 2020), this study's findings support the idea that one's ability to remain self-aware and nonjudgmental during sexual experiences may be a protective factor against negative self-evaluations and insecurities regarding one's value in socio-sexual contexts. However, further research is required to confirm the direction of these associations.

Lower sexual mindfulness (awareness and nonjudgment), higher sexual anxiety, and lower sexual self-esteem partially explained the associations between avoidant attachment and lower sexual satisfaction. Since attachment avoidance is marked by the avoidance of intimacy-related thoughts and feelings (Mikulincer & Shaver, 2003), the distress engendered by physical and emotional intimacy may lead to a lower mindfulness disposition (Stevenson et al., 2017), which seems replicated in our sample when we specifically explored mindfulness skills during sexual encounters. This may translate into an inability to connect to one's emotions (Goodall et al., 2012) as well as with one's partner during intimate contexts (Hazan & Shaver, 1987), thus increasing preoccupations and anxiety surrounding one's sexuality and negatively impacting self-perceived value as a sexual partner, which may ultimately impair sexual satisfaction. However, the significant direct link between higher attachment avoidance and lower sexual satisfaction suggests that other possible mechanisms are probably involved. Future research testing more complex mediation models in longitudinal designs could examine whether difficulties with sexual assertiveness, relational commitment, and intimacy or sexual avoidance play mediating roles in this association.

Since this study's findings suggest that attachment and sexual mindfulness might play a role in fostering sexual satisfaction, our results allow to put forth some avenues for sex therapists who specifically work with clients seeking to improve their sexual satisfaction. Firstly, it might be important to consider attachment insecurities when assessing and treating individuals presenting low sexual satisfaction. In certain cases, attachment-focused therapeutic interventions, such as Emotionally Focused Therapy (Johnson, 2019), could be fruitful as they aim to foster a secure attachment base within a romantic relationship, where both partners can solidify their trust for one another. In turn, this could alleviate attachment-related distress and its impact on relational and sexual satisfaction (Birnbaum & Reis, 2019; Burgess et al., 2016). Secondly, developing sexual mindfulness skills may foster one's awareness of one's own attachment reactions, along with the metacognition that is needed to observe one's mental states as they emerge during sexual activity without judgment, allowing for a better control of one's reactions to those internal state (e.g., awareness of one's window of comfort in sexual contexts, embracing embodied sexual sensations, defusion from critical internal discourse regarding performance, etc.). As research on sexual mindfulness is still in its early stages, more empirical evidence is required. Our findings also echo clinical evidence (Caldwell & Shaver, 2015; Cordon, Brown, & Gibson, 2009) that suggest that mindfulness-based programs may be a promising approach to improve stress-related coping strategies and mitigate the manifestations of insecure attachment, such as hypervigilance or emotional dysregulation, that may arise in sexual contexts as sexual anxiety or self-esteem concerns. However, it remains to be determined whether validated mindfulness-based treatments, such as Mindfulness-Based Stress Reduction Therapy (Teasdale, Segal, & Williams, 1995) or Mindfulness-Based Cognitive Therapy (Segal, Williams, & Teasdale, 2002), could positively impact sexual satisfaction through the modulation of perceptions and cognitive processes related to insecure attachment. Finally, if several mindfulness-based programs have been used for or adapted

to low sexual satisfaction or sexual difficulties (e.g., sexual desire and arousal disorders, erectile dysfunction, genito-pelvic pain; Brotto, Chivers, Millman, & Albert, 2016; Bossio, Basson, Driscoll, Correia, & Brotto, 2018), specific programs explicitly aiming to enhance sexual mindfulness are yet to be developed.

Although the present study provides a significant contribution to the sexual wellbeing literature, certain limitations should be noted. The first limitation pertains to the study's cross-sectional design, which prevents conclusions from being drawn regarding the causality and directionality of the relationships between the examined variables. For instance, while attachment security may contribute to one's increased mindfulness and sexual satisfaction, it is also possible that an individual may become more insecure and less mindful due to persistently low sexual satisfaction and to sexual encounters that are consistently marked by sexual anxiety and low sexual self-esteem (Stevenson et al., 2017; Zhou, Lin, Li, Du, & Xu, 2020). The postulated directionality was empirically, and theoretically driven and future work should test the longitudinal associations to confirm this directionality, as well as provide alternative models. Secondly, this study used self-reported data on a self-selected sample. Thus, the results may be prone to biases such as shared method variance, social desirability, and recall biases (Boislard & Poulin, 2015). Thirdly, this research focuses solely on sexual satisfaction as the distal outcome. Future research should examine the relationships between sexual mindfulness and sexual functioning to explore its applicability and relevance in clinical practice (i.e., assessment and treatment of sexual dysfunctions). Fourthly, the sample was not representative of the general population (e.g., predominantly women), limited to the French-Canadian population, and was recruited during the peak period of the COVID-19 pandemic, the latter of which affected many people's intimate relationships (e.g., parents who had their children at home during the pandemic), thus affecting the findings' generalizability. Finally, while our model explained a substantial proportion of variance in sexual satisfaction (44.1%), the amount of unexplained variance prompts us to explore additional mechanisms that may explain the associations between insecure attachment and sexual satisfaction.

Conclusion

To summarize, our results suggest that lower sexual mindfulness and sexual self-esteem, and higher sexual anxiety account for the relationship between insecure attachment and sexual dissatisfaction. As such, forming a secure bond with our sexual partner(s) as well as fostering our own capacity to be fully present and nonjudgemental within a sexual context seem to be key components of a more fulfilled sex life, resulting in heightened sexual satisfaction.

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Compliance with ethical standards

Disclosure statement

No potential conflict of interest was reported by the authors.

Ethical approval

All procedures involving human participants performed in this study were approved by the Université du Québec à Montréal Institutional Ethics Review Board (certificate number: 4025_e_2020).

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