Use of Geosocial Networking Applications Is Associated With Compulsive Sexual Behavior Disorder in an Online Sample

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ABSTRACT

Background: Geosocial networking applications (GNAs) are relatively new outlets through which individuals may find partners for sexual encounters. There has been a paucity of research on the associations between use of these platforms and measures of mental health and compulsive sexual behavior disorder (CSBD).

Aim: To examine associations between use of GNA, anxiety, and CSBD.

Methods: Using data from a large nontargeted Web-based sample (N = 4,203), we examined demographics associated with the use of GNAs. Using multivariable logistic regression adjusting for demographic differences between users and non-users, we examined associations between GNA use, anxiety, and CSBD.

Outcomes: The outcomes are Generalized Anxiety Disorder-7 and a modified Hypersexual Behavior Inventory-19.

Results: The percentage of participants that reported they used GNAs was 12.3%. Those who reported using the applications compared with those who did not were more likely to be young, male, and nonheterosexual. After adjusting for demographic variables, GNAs use was associated with CSBD (adjusted odds ratio = 1.62, 95% confidence interval: 1.09—2.37, $P = .015$) but not anxiety.

Clinical Implications: This study is an initial foray into the relationships between GNA and mental health, establishing a relationship between GNA use and CSBD. Future research is needed to better understand the relationships between GNA use, psychopathology, and CSBD.

Strengths & Limitations: Strengths of the study include its large sample size and nontargeted recruitment design, which minimizes confirmation bias. Limitations include the cross-sectional nature of this study, which precludes determination of the direction of causation.

Conclusion: Use of GNAs was prevalent among our sample and associated with CSBD. GNA use may represent an important platform through which CSBD manifests. Conversely, GNA use may drive CSBD. **Turban JL, Passell E, Scheuer L, et al. Use of Geosocial Networking Applications Is Associated With Compulsive Sexual Behavior Disorder in an Online Sample. J Sex Med 2020;17:1574—1578.**

INTRODUCTION

Geosocial networking applications (GNAs) are digital social media platforms through which individuals can create a personal profile and connect with nearby users to form new relationships.[1]

These platforms use global positioning system technology to connect users based on geographic proximity to each other.[1] Popular examples include Grindr, Tinder, Scruff, Her, and Jack'd, among others.

Most research on these platforms has focused on non-heterosexual cisgender men. Researchers have largely focused on Grindr, a popular GNA, with an estimated 6 million users in 192 countries, and the associations between Grindr use and sexual behaviors and sexually transmitted infections.[1] Studies have shown that GNA use is associated with having unprotected anal intercourse[2] and the acquisition of sexually transmitted infections.[3] For this reason, some have argued that GNAs such as Grindr may be attractive platforms through which sexually

transmitted infection—prevention programs could be implemented.[4]

While a body of research regarding GNAs and sexual health is emerging, there are limited data regarding the interactions between GNAs and mental health. In a recent qualitative study of rural non-heterosexual men, participants noted that GNAs can provide a sense of community that would otherwise be difficult to develop, as few users are openly non-heterosexual or "out," and users feel more comfortable connecting with other non-heterosexual users online.[5] However, participants also noted that GNAs can have an isolating effect owing to anonymity and limited relationship development that is often based on sexual relationships.[5] In a study of 200,000 iPhone users, 77% of Grindr users reported feeling unhappy after using Grindr.[6] There has been an even greater paucity of research regarding the use of GNAs by heterosexual users; however, in one study of Tinder users, app use was associated with feelings of shame and body dissatisfaction.[7]

Compulsive sexual behavior disorder (CSBD) was recently included in the International Classification of Diseases 11th Revision and is defined as "a persistent pattern of failure to control intense, repetitive sexual impulses, or urges resulting in repetitive sexual behavior" that impairs personal, family, social, educational, occupational, or other important areas of functioning.[8] In the past, we have theorized that some individuals with internalizing psychopathology (ie, anxiety or depression) may use digital sexual outlets as a way to alleviate negative affect and that this behavior may become compulsive, leading to CSBD, which has also been termed "hypersexuality."[9] We found in a convenience sample of US veterans that digital sex seeking was associated with anxiety, depression, and CSBD.[9] Although it is difficult to generalize these findings to the general population, we hypothesized that GNA may be associated with anxiety and CSBD in the civilian population as well.

An alternative explanation for how GNA use could lead to CSBD is through intermittent ratio reinforcement.[6] Under this theoretical model, rewards for GNA use (ie, orgasm and sexual satisfaction) come at unpredictable intervals (ie, intermittent ratio reinforcement).[6] It has been well documented that this reinforcement schedule makes reinforced behavior difficult to extinguish.[6] Under this model, the behavior need not necessarily be driven by an attempt to alleviate negative affect but rather by a drive toward reward.

Using a large non-targeted online sample, we examined the prevalence of GNA use and demographic variables associated with use. We then examined associations between GNA use, anxiety, and CSBD.

METHODS

Participants

Participants were recruited through TestMyBrain.org, an on-line platform where visitors can participate in research and receive immediate personalized feedback. TestMyBrain is a citizen science research platform where people can participate in research on the mind, brain, and mental health, in exchange for individualized feedback about their own scores in relation to others who have completed the same measures. People come to TestMyBrain from a variety of sources, primarily organic search engine queries (eg, "learn about my brain" or "brain tests") or links posted by previous participants on social media. Previous studies have shown that data from TestMyBrain are similar in quality to data collected in traditional settings[10] and that findings from TestMyBrain samples replicate findings from traditional research studies,[11,12] including nationally representative samples.[13]

For the present study, participants received their generalized anxiety disorder 7-item scale (GAD-7) score and how this score compared with other TestMyBrain.org participants as immediate study feedback. To avoid confirmation bias, measures were embedded within a battery shown to participants under the name "life experiences and face attractiveness," which included a facial attractiveness judgment task and a choice reaction time task as well as the measures of interest. The present study was approved by the Harvard Commitee on the Use of Human Subject.

Measures

GNA Use

Participants were asked if they used any of several commonly used GNAs (Tinder, Scruff, Jack'd, Grindr, Her, Coffee Meets Bagel, and Bumble). Participants endorsing use of any of these GNAs were coded as "users" and those who did not endorse using one of these were coded as "non-users." Note that this method could have resulted in those who use less popular GNAs being coded as "non-users," increasing the likelihood of a type II error.

Generalized Anxiety

The GAD-7 is a screening instrument for generalized anxiety disorder and has been shown to have high sensitivity (89%) and specificity (82%).[14] Each item is scored on a 4-point Likert scale (0 to 3), with scores ranging from 0 to 21. A score greater than or equal to 11 was used to define clinically significant anxiety.[14]

Compulsive Sexual Behavior Disorder

The hypersexual behavior inventory (HBI) is a 19-item scale that measures clinical characteristics of CSBD (eg, "I feel like my sexual behavior is taking me in a direction I don't want to go.").[15] Each scale item is scored on a 5-point Likert scale (1 to 5), with total scores ranging from 19 to 95. A score of 53 has been proposed as a clinical cutoff for CSBD.[15] For the present study, to increase retention, the Likert scale was converted to a True/False judgment where "True" responses were given a score of 1 and "False" responses were given a score of 0, giving a total score of 19 for the whole measure. To ensure reliability and validity of the modified HBI, we separately collected data to

compare the Likert and True/False versions in N = 234 participants recruited from TestMyBrain.org. Each participant was randomized to receive half of the HBI items in Likert scale format and half in True/False format. Scores on the 2 forms were correlated at r = 0.87 (95% confidence interval [CI] = 0.82−0.91) and r = 0.91 (95% CI = 0.88−0.94), with internal reliabilities (calculated using the split-half method) of 0.87−0.89 for the True/False versions and 0.939−0.944 for the Likert scale versions, indicating that the modified HBI is both reliable and valid. For the modified HBI, we coded scores greater than or equal to 11 as CSBD, based on transformation of the original HBI cutoff of 53.

Statistical Analyses

Participants were classified as GNA users if they reported using any of the applications listed in the survey on GNA use, regardless of the frequency of use. For demographic variables, significance was tested with χ^2 tests for categorical variables and t-tests for continuous variables. To determine the relationship between GNA use and clinically significant anxiety and CSBD, we conducted logistic regressions, controlling for demographic variables that were significantly different between users and non-users. We also computed adjusted odds ratios based on these regression models. All data analysis was conducted in R.

RESULTS

12.3% of participants endorsed using GNAs. App users were more likely to be male, younger, and non-heterosexual (Table 1). After adjusting for these covariates, GNA use was associated with CSBD (adjusted odds ratio = 1.62, 95% CI 1.09−2.37, P = .015). No association was detected between GNA use and clinically significant anxiety (Table 2). We additionally examined the GAD-7 score as a continuous variable and again found no association between GNA use and anxiety.

DISCUSSION

We found that a sizable minority (12.3%) of our online sample engaged with GNAs. GNA use was especially prevalent among gay and bisexual men (26.4%), and users were on average younger. The high rate among sexual minority individuals may be owing to these individuals feeling safer exploring sex and romance online, rather than through in-person venues that may stigmatize non-heterosexual individuals.[6] The younger age of

Table 1. Demographic variables comparing those who use geosocial networking applications "app users" and those who do not use geosocial networking applications "non-users"

Variable [range]	Non-users n (%)	M (SD)	App users n (%)	M (SD)	P
Total participants	3,688		515		
Age [18−99]		33.28 (15.01)		26.11 (8.28)	**<.001**
Gender					
Male	1,630 (44.2%)		285 (55.3%)		
Female	1,999 (54.2%)		216 (41.9%)		
Non-binary/Genderqueer	50 (0.4%)		14 (2.7%)		**<.001**
Sexual orientation					
Heterosexual	2,376 (64.4%)		307 (59.6%)		
Gay	119 (3.2%)		41 (8.0%)		
Bisexual	421 (11.4%)		81 (15.7%)		
Asexual	64 (1.7%)		3 (0.6%)		**<.001**
Race					
American Indian or Alaska Native	135 (3.7%)		15 (2.9%)		
Asian	819 (22.2%)		91 (17.7%)		
African/Black	159 (4.3%)		20 (3.9%)		
European/White	1865 (50.6%)		302 (58.6%)		
Native Hawaiian or Pacific Islander	26 (0.7%)		3 (0.6%)		.013
Education					
None/Not specified	18 (0.5%)		0 (0.0%)		
Primary school	15 (0.4%)		1 (0.2%)		
Middle school	72 (2.0%)		9 (1.8%)		
High school	535 (14.5%)		62 (12.0%)		
Some college	775 (21.0%)		129 (25.1%)		
Technical training/associate's degree	183 (5.0%)		29 (5.6%)		
Bachelor's degree	845 (22.9%)		139 (27.0%)		
Gradaute school	666 (18.1%)		75 (14.6%)		.010

Participants were asked to select all categories that applied when reporting their race. Thus, percentages do not add to 100. Bold indicated statistical significance. Categorical variables were compared using χ^2 tests and continuous variables were compared using t-tests.

Table 2. Associations between geosocial networking application (GNA) use, clinically relevant anxiety (GAD-7 ≥ 10) and compulsive sexual behavior disorder (HBI ≥ 11), adjusted for age, gender, and sexual orientation

Outcome	N	% In GNA users	% In GNA nonusers	AOR (95% CI)	P
HBI ≥ 11	4,028	7.74	3.65	1.62 (1.09, 2.37)	.015
GAD-7 ≥ 10	3,509	45.37	43.89	0.87 (0.70, 1.08)	.21

aOR = adujusted odds ratio.

GNA users compared with non-GNA users may represent relatively more comfort with technology among younger people. The higher rates of GNA use among males may be secondary to social pressures against women engaging in casual romantic or sexual relationships. More research is needed to better understand the reasons for these demographic differences.

In contrast with past studies that found associations between digital sex seeking and poor mental health,[9] we found no association between GNA use and anxiety. We did, however, find a significant association between GNA and CSBD.

Given the cross-sectional nature of this study, it is impossible to determine the direction of causation between GNA use and CSBD. One possibility is that GNAs represent platforms through which CSBD manifests.[16] Alternatively, GNAs may drive CSBD. GNAs such as Grindr can be understood as using intermittent variable ratio reinforcement, providing validation and sexual excitement at unpredictable intervals. This model of reinforcement has been shown to have strong addictive potential and is one proposed mechanism for the addictive nature of slot machines in gambling disorder.[17]

Our second theory that GNA use leads to CSBD as individuals attempt to self-sooth negative affect was not supported by our findings, as anxiety levels were not elevated among GNA users. Although we did not find associations between anxiety and GNA, it is plausible that other types of psychopathology that were not measured in the present study (eg, depression) may lead individuals to engage with GNAs, later leading to CSBD.[6] Future research should examine this possibility.

Strengths of this study include its large sample size and non-targeted recruitment design, which minimizes confirmation bias. Limitations of this study include its cross-sectional design, which limits interpretation in terms of direction of causation. The present study also lacked additional information regarding participants' GNA use (frequency of use, goals of use, number of GNAs used, whether participants have sex with partners met on GNAs, and so on.). Future research should collect more granular data on the ways in which participants engage with GNA. It is important to note that the HBI was developed before the addition of CSBD to the International Classification of Diseases 11th Revision.[8,15] Future research should use CSBD-specific scales. Future qualitative research will be helpful to better understand the motivations to use GNA and the mental health sequelae of use. Future research should also explore other measures of psychopathology, as the present study examined only anxiety. An additional limitation is our use of a crowdsourced sample, which allowed us to get a large sample size but introduces potential self-selection biases. Future studies with nationally representative samples might clarify prevalence of GNA use and give more accurate population level associations.

Overall, this study is an initial foray into understanding the relationships between GNAs and mental health. Further research is needed to understand the relationships between GNA use, psychopathology, and CSBD.

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