

Assessing Self-Control and Geosocial Networking App Behavior Among an Online Sample of Men Who Have Sex with Men

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ABSTRACT *Geosocial networking phone applications (GSN apps) used to meet sexual partners have become popular in the men who have sex with men (MSM) communities of the USA since 2009. Previous studies have shown greater incidence of gonorrhea and chlamydia and lower testing frequency for HIV testing among GSN app users when compared to non-users. The present study aims to determine the type, number, and frequency of apps used, as well as the association between dispositional self-control and health-related behaviors. Participants (n = 146) were recruited from Amazon's Mechanical Turk program to respond to a brief GSN app marketing survey. Multivariate regression was used to determine differences in app priorities, length of app use, and number of sexual partners between high self-control and low self-control participants. A majority of the participants reported using Grindr (78 %) followed by Scruff (19 %), Growlr (12 %), and Jack'd (12 %). Most individuals used one app only (58 %), but a significant proportion reported using two apps (28 %) or three or more apps (14 %). Respondents with low self-control were more likely to report a higher number of hours using GSN apps and a higher number of sexual partners, controlling for race/ethnicity, education, employment, and HIV status. Given the popularity of this burgeoning communication medium, these findings have important implications for developing prevention resources for different segments of GSN app users.*

KEYWORDS *Self-control men who have sex with men, Social networking apps, Geosocial networking apps*

INTRODUCTION

In March of 2009, a Los Angeles-based company named *Grindr* launched a new type of social network where new connections were not made through personal connections (e.g., Facebook) or professional connections (e.g., LinkedIn) but through sheer geographical proximity to other users. This geosocial networking app (GSN app) utilizes the smartphone's internal global positioning system to map the user's location in relation to other users, with those closest in proximity appearing first.

Catering to gay, bisexual, and other men who have sex with men (MSM), *Grindr* experienced a rapid uptake in a community where identifying potential sexual

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partners has historically been risky, especially in areas with high levels of homophobia.¹ In 2013, the company reported that it had over four million users in 192 different countries.² Other developers took notice of *Grindr*'s meteoric rise, and me-too apps like *GROWLr*, *BoyAboy*, *MR X*, and *SCRUFF* were established to cater to different segments within MSM community. For example, *GROWLr* advertises in the Google Play store that users can meet "gay bears near you"³ with the term "bear" referring to a gay man that both is larger in size or weight and has an above average amount of body hair.

The proportion of MSM using these apps has increased substantially between 2011 and 2013. In August 2011, approximately 14 % of MSM clients receiving HIV and sexually transmitted disease (STD) screening services at the Los Angeles LGBT Center reported recently using GSN apps to meet sexual partners. In August 2013, the proportion of MSM receiving screening HIV/STD services who reported GSN app use to meet sexual partners increased to 24 %.⁴ Although Los Angeles is only one area in the USA, the increased user base for *Grindr* and the emergence of competing apps show that there is substantial demand in the MSM community for GSN apps.

While GSN apps may be increasingly popular, including also among heterosexual populations (e.g., Tinder), increased efficiency in meeting sexual partners could possibly lead to increased sexual risk-taking behavior and adversely affect the sexual health of MSM using these apps. A study by Rendina et al. found that a greater proportion of *Grindr* users had never been tested for HIV when compared to a population-based sample of MSM.⁵ Another study by Landovitz et al. in Los Angeles found that 46 % of MSM using *Grindr* reported unprotected intercourse in the past 3 months.⁶ A study by Lehmler and Ioerger found that app users reported a significantly higher prevalence of ever being diagnosed with an STD compared to non-users.⁷ Last, a study by Beymer et al. showed that individuals using *Grindr* had a greater odds of contracting both gonorrhea (AOR = 1.25) and chlamydia (AOR = 1.37) when compared to individuals who solely used in-person methods like going to bars or clubs to meet sexual partners.⁸

It is unclear how the dispositional tendency to exercise self-control may influence sexual behavior when interfacing with these GSN apps. In 1992, Exner et al. found that MSM with low self-control had a greater number of sexual partners and were more likely to use drugs during sex.⁹ More recently, Adam et al. showed that sexual self-control was protective against unprotected anal intercourse with casual partners, but it was not protective on number of sexual partners or infections with an STD.¹⁰ While both of these studies present important findings, they were both conducted before the advent of smart phone apps and thus did not analyze domains unique to app use. Lehmler and Ioerger found no differences between app users and non-app users in self-control. However their analysis did not look at within group differences.⁷ Thus, it is unclear how self-control impacts the number of apps used, the length of app use, or the number of sexual partners resulting from meetings facilitated by these apps. Furthermore, it is unclear if self-control scores may be associated with prioritization of viewing a potential user's HIV/STD results and thus ability to navigate safely through this electronic medium.

The objectives of this study are threefold: (1) determine the type, number and frequency of GSN apps used among a sample of MSM in the USA (2) describe how trait-based self-control is related to app user behaviors, and (3) determine if there's a link between self-control and prioritization of HIV/STD results. Elucidation of how these apps are used and the priorities for app users could reveal important

information that can be used by app developers to maximize the safety of the user experience.

MATERIALS AND METHODS

Data Collection

Participants were recruited from Amazon's Mechanical Turk (MTurk) platform (Seattle, WA) from November 24th, 2013 to May 19th, 2014. MTurk is an online survey engine that allows researchers, called requesters, to post surveys on different topics from marketing to public health. Individuals sign up to become workers and are paid funds to complete surveys called Human Intelligence Tasks (HITs).¹¹ These completed HITs can be either approved or rejected by the requester, and payment is conditional upon approval. Provided a worker's HIT is approved, individuals are paid a credit to their Amazon.com account for each HIT taken. These credits can then be redeemed for products on the website or transferred to an individual's bank account. In order to preview the HIT for this study, MTurk workers were required to be (1) located in the USA and (2) have a HIT approval rate of greater than or equal to 95 %. These measures were intended to increase data validity and maintain a homogenous sample of MSM within the USA.

Within the survey description, participants were instructed to complete the survey using a link posted on the MTurk HIT. The survey was programmed using Qualtrics software (Provo, UT), a platform that provides easy to use survey creation. The Qualtrics' "prevent ballot box stuffing" option was used in order to prevent individuals from taking the survey multiple times.

Participants were instructed to complete a four question screening tool to determine their eligibility for the study. Participants were allowed to complete the full survey if they met the following inclusion criteria: (1) birth sex and current gender of male (subsequently referred to as cis-gender male), (2) sex with at least one man in the past 12 months, (3) currently owned a smart phone, and (4) had used GSN smart phone apps to socialize with other gay and bisexual men in the past month. A total of 652 participants were screened for this survey, and 245 met the above inclusion criteria for participation.

Participants not meeting the screening criteria were redirected to a disqualification page. The reasons for ineligibility were incompleteness of screener ($n=56$), non cis-gender male identification ($n=63$), no sex with another man in the last 6 months ($n=140$), did not own a smart-phone ($n=24$), did not use GSN apps to meet other men in the past month ($n=119$). All participants were paid \$0.50 for their participation, regardless of passage of the screening criteria.

Although the core set of questions on GSN app behaviors and preferences remained the same, additional questions were added in a second phase of the study that asked about self-control, depression, compulsivity, and demographics ($n=74$ in Phase I; $n=171$ in Phase II). Therefore, a total of 245 individuals took the survey, but only 171 were asked the expanded questionnaire set. This study focuses only on the individuals who completed all questions.

After completing the screening assessment, participants were asked to list the specific GSN apps they used to socialize with other gay and bisexual men. Each response was checked for validity to ensure that the app(s) listed met the criteria for a GSN app. Twenty-five individuals were excluded during this inspection since the

specific apps mentioned did not include GSN apps (e.g., Google, iTunes, WhatsApp) for a final sample size of 146.

The remainder of the survey asked a series of demographic and marketing questions about the number of apps used, the frequency of use, and willingness to pay for an upgraded version of these applications. Participants were then asked a series of rank-order questions which instructed them to rank their most preferred (1) app attributes, (2) profile attributes, and (3) convenience items, with each category containing five options where 1 indicated the highest priority and 5 the lowest priority.

These features were selected from the most common attributes and software features mentioned in 100 random reviews by individuals posting reviews in the iTunes and Android marketplaces for the following apps: *Grindr*, *Scruff*, *Jack'd*, and *BoyAhoy*. These features were separated into three categories. The first category, app attributes, is a general category that concerns the price, customer service, and software glitches. Profile attributes made up the second category and is tied to the frequency of different items including users, number of visible users, and number of pictures. The third category was titled “convenience items” which connotes attributes related to “ease-of-use” and users’ impatience.

The final section of the assessment asked about self-control, depression, compulsivity,¹³ and demographics. The Tangney Self-Control Scale was used to assess self-control. The original 36-item scale was shown to be reliable in this sample with an internal consistency of $\alpha = 0.89$.

Statistical Analyses

A dichotomized self-control variable was created using a spotlight analysis approach to split the variable at the 25th and 75th percentiles. Briefly, spotlight analysis creates focal points (e.g.,¹³ high self-control and low self-control) in order to ease interpretation of results. Following creation of this variable, independent samples *t* tests were used to assess the relationship between this dichotomized self-control measure and a set of five: (1) app attributes; (2) profile attributes; and (3) convenience items.

Following this analysis, the continuous measure of the self-control variable was used to test whether self-control was a significant predictor of the number of apps used, length of app use, number of sexual partners, prioritization of HIV/STD results, and likelihood of paying for additional features in multivariable regressions. Poisson regressions were used for count outcomes and logistic regressions were used for binary outcomes. For Poisson models, overdispersion was checked and goodness-of-fit Chi-square tests were used to check model fit. All models controlled for race/ethnicity, education, employment, and HIV status. All analyses were performed using SAS version 9.3 (Cary, NC).

RESULTS

On average, it took 5 min and 24 s to complete the survey (interquartile range, 2:48 to 7:04) for individuals who answered all questions ($n = 146$). Participants who answered the demographics questions most frequently identified as White (75 %) followed by Hispanic (8 %), African-American (6 %), Other Race (8 %) and Asian/PI (4 %; Table 1). Over one third (38 %) reported a college degree for educational attainment, 36 % reported some college, 14 % reported graduate study, and 12 % had less than a college degree. A majority of participants reported full-time work

TABLE 1 Demographics of included participants (*n* = 146)

Demographic	<i>n</i>	%
Race/ethnicity		
White	109	74.7
African-American	9	6.2
Hispanic	11	7.5
Asian/PI	6	4.1
Other	11	7.5
Education level		
High school graduate/GED	17	11.6
Some college	53	36.3
College degree	55	37.7
Post-graduate study/degree	21	14.4
Employment status		
Employed full-time	88	60.3
Employed part-time	25	17.1
Not employed	28	19.2
Missing	5	3.4
Relationship status		
Single	80	54.8
Main partner with casual partners	29	19.9
Main partner with no casual partners	37	25.3
HIV status		
Positive	7	4.8
Negative	133	91.1
Don't know	4	2.7
Missing	2	1.4
Number of geosocial network apps used		
1 app	86	58.9
2 apps	42	28.8
3 apps or more apps	18	12.3
State of residence		
Alabama	4	2.7
Arizona	2	1.4
California	19	13.0
Colorado	1	0.7
DC	2	1.4
Florida	9	6.2
Georgia	5	3.4
Hawaii	1	0.7
Illinois	12	8.2
Indiana	1	0.7
Iowa	1	0.7
Kentucky	6	4.1
Louisiana	2	1.4
Maryland	3	2.1
Massachusetts	2	1.4
Michigan	4	2.7
Minnesota	1	0.7
Missouri	3	2.1
Montana	1	0.7
Nebraska	3	2.1
Nevada	3	2.1

TABLE 1 *Continued*

Demographic	<i>n</i>	%
New Hampshire	1	0.7
New Jersey	7	4.8
New York	7	4.8
North Carolina	6	4.1
Ohio	6	4.1
Oklahoma	1	0.7
Oregon	2	1.4
Pennsylvania	9	6.2
Rhode Island	1	0.7
South Carolina	2	1.4
Tennessee	2	1.4
Texas	12	8.2
Utah	1	0.7
Washington	1	0.7
Wisconsin	1	0.7
Unknown	2	1.4
Length of daily geosocial network app use		
Mean	42 min	
Standard deviation	62 min	
Number of sexual partners in the past month		
Mean	2.86 sex partners	
Standard deviation	4.18 sex partners	
Self-control outcome		
Mean	3.18	
Standard deviation	0.53	
Total	146	100.00

(60 %) and part-time work (17 %), but a sizeable proportion was not employed (19 %). Approximately 55 % of participants reported their relationship status as single, 20 % of participants reported having a main partner and casual partners, and 25 % of participants reported having a main partner with no casual partners. Of those who responded to the HIV status question, 91 % were HIV negative, 5 % were HIV positive, and 3 % did not know their HIV status. Approximately 59 % of participants reported using only one GSN app, 29 % reported using two apps, and 12 % used three or more apps. Participants reported a wide geographic distribution with 36 of the 50 states represented in the USA.

The mean amount of daily GSN app use was 42 min (SD = 62 min). The mean number of sex partners in the last month was 2.86 (SD = 4.18). The range of values for self-control was between 1 and 5 with participants averaging a score of 3.18 (median = 3.08; standard deviation = 0.53). The most common apps used were *Grindr* (78 %) followed by *Scruff* (19 %), *Growlr* (12 %), and *Jack'd* (12 %) (Table 2).

Independent samples, *t* tests revealed that prioritization of price of initial download ($p = 0.62$), log-on requests ($p = 0.25$), speed that the company fixes glitches ($p = 0.64$) and quality of customer service ($p = 0.74$) were not significantly different between individuals in the low self-control and high self-control groups (Table 3). Minimal loading time was significant at the 0.05 level ($p = 0.05$).

TABLE 2 Type of geosocial networking apps used in the past month by participants ($n = 146$)

App(s) used	<i>n</i>	%
Adam4Adam/Radar	10	6.8
BoyAhoj	4	2.7
Craigslist	1	0.7
Grindr	114	78.1
Growlr	17	11.6
GuySpy	1	0.7
Hornet	11	7.5
Jack'd	18	12.3
Manhunt	2	1.4
Mister	2	1.4
Recon	2	1.4
Scruff	28	19.2
Skout	5	3.4
Tinder	7	4.8
Other ^a	8	5.5
Total	146	100.0

App use is not necessarily mutually exclusive since an individual can use more than one app. Therefore, the numbers exceed 146 when cumulatively added

^aOther were apps that were only mentioned once or twice (Grommr, Squirt (2), Bender (2), GayGuysMeet, Gayvox, Krave, OKCupid (2), VGL, iDate, Plenty of Fish (2))

In regard to profile attributes, high self-control users reported placing significantly greater importance of the number of users one could see, when compared to low

TABLE 3 Spotlight analysis of mean scores for rank order questions and independent sample *t* tests on self-control and measured attributes ($n = 80$)

Attribute	Low self-control	High self-control	<i>p</i> value
App attributes			
Price of initial download	2.05	1.90	0.62
Minimal loading time/speed of use	2.23	2.73	0.05
Speed that the company fixes bugs/glitches in the software	3.45	3.33	0.64
Quality of customer service	3.63	3.73	0.74
Stays logged in/few log-on requests	3.65	3.33	0.25
Profile attributes			
Number of men using the app	1.7	1.73	0.93
Number of other users you can see	2.38	1.90	0.03
Number of pictures you can post or view	2.98	3.20	0.26
Number of profiles you can add to your favorites	3.9	4.33	0.06
Number of other users you can block	4.05	3.85	0.41
Convenience items			
Ease of uploading or sending pictures	2.25	3.03	0.004
Ease of filtering out non-local user profiles and messages	2.95	2.33	0.04
Ease of seeing another user's HIV/STD results	2.95	3.00	0.87
Ease of filtering out offline profiles	3.28	3.50	0.49
Ease of blocking ads	3.58	3.15	0.21

self-control users ($p=0.03$). However, there were no significant mean differences detected between low self-control and high self-control users on the number of men using the app ($p=0.93$), number of pictures to post/view ($p=0.26$), number of blocks ($p=0.41$), or number of profiles to add to favorites ($p=0.06$).

In regard to convenience items, as expected, respondents with low self-control reported higher prioritization for uploading/sending photos ($p=0.004$) but lower prioritization for filtering out non-local user profiles ($p=0.04$). There was no mean difference between low self-control and high self-control respondents on seeing another users STD/HIV results ($p=0.87$), ease of blocking ads ($p=0.21$), or ease of filtering out offline profiles ($p=0.49$). There may be a difference among these attributes, but possibilities for a type II error given the sample size may have prevented detection.

Multivariable Poisson regressions revealed that (positive) self-control was significantly inversely associated with the length of app use ($p=0.02$) and number of sexual partners ($p<0.0001$), controlling for race/ethnicity, education level, employment, and HIV status. However, multivariable logistic regression models showed that self-control was not significantly associated with likelihood of paying for additional features ($p=0.15$) or HIV/STD results prioritization ($p=0.46$), when controlling for the aforementioned covariates (Table 4).

DISCUSSION

The present study found that individuals with low self-control were significantly more likely to report a greater number of sexual partners and higher daily GSN app use on average than individuals with high self-control. Furthermore, this study found that self-control was not associated with the prioritization of viewing another user's HIV/STD results or the number of GSN apps used.

The number of sexual partners among MSM has been shown to be an important predictor of HIV infection in the male gay and bisexual communities of the USA.^{14,17} Given that 92 % of individuals who reported their HIV status were HIV-negative, participants with low self-control may be at a greater risk for HIV infection with an elevated number of partners. Furthermore, the low mean prioritization of HIV/STD

TABLE 4 Multivariate regression models of self-control and length of app use, number of apps used, number of sexual partners, prioritization of HIV/STD results and likelihood to pay for additional features ($n = 146$)

Dependent variable	Estimate	Standard error	Point estimate (95 % CI)	<i>p</i> value
Poisson regression results				
Length of app use	-0.28	0.12	0.76 (0.59–0.96)	0.02
Number of apps used	-0.09	0.13	0.91 (0.7–1.19)	0.49
Number of sexual partners ^a	-0.85	0.15	0.43 (0.36–0.58)	<0.0001
Logistic regression results				
Prioritization of HIV/STD results	0.25	0.34	1.29 (0.66–2.53)	0.46
Likelihood to pay for additional features	0.44	0.31	1.56 (0.86–2.83)	0.15

Controlling for race/ethnicity, education level, employment status, and HIV serostatus

^aCorrected for overdispersion

results, regardless of self-control level, implies that GSN app users may not be concerned with HIV/STD results of prospective sexual partners, therefore putting them at further risk for contracting HIV.

This study is subject to important limitations. The cross-sectional study design did not allow us to draw conclusions about longitudinal GSN app use behaviors. Second, the study had two phases which added additional questions in the second phase such as demographics. Since demographic questions were not asked in both phases, demographic comparisons were not possible to assess comparability of populations. Third, other outcomes possibly related to self-control were not measured such as substance use, frequency of unprotected intercourse, and sexually transmitted diseases. Future studies investigating self-control among MSM respondents should look at all significant items shown a priori to be related to sexual health among MSM.

Fourth, although the recruitment platform was nationally-based in the USA, internet surveys have historically been biased in regards to the demographics of the participants recruited.¹⁸⁻²¹ Despite this limitation, Amazon's Mechanical Turk has been shown to be more demographically representative of the US population when compared to standard internet sampling platforms.^{22,23} In addition, internet surveys are also subject to higher rates of drop-out and repeat participations,²⁴ but participants in this study were not given their compensation code until the end of the study and the "prevent ballot box stuffing" option in Qualtrics ensured that participants did not take the survey multiple times. A requirement of a 95 % HIT approval rate was used which likely increased validity of results but may have biased the sample towards individuals who were more likely to complete the task. The respondents were generated via nonprobability sampling which has been shown to be less representative than respondents generated through probability sampling.²⁵ Although participants were self-selected, the screening tool was used to include only a defined population for this study.

GSN apps provide an effective way to meet other sexual partners, but their primary use does not necessarily preclude their simultaneous use as health platforms. Account registration could include a simple survey that assesses key psychosocial indicators, such as the brief Tangney self-control scale, that have been shown to be linked with risk of HIV/STD risk, and provide periodic resources based on an individual's profile and frequency of use. Alternatively, GSN apps could use the global positioning system function to show users the location of HIV/STD testing centers within close proximity as a reminder to test periodically. Last, companies could provide added features at no cost for users who agree to answer periodic health surveys. The data from these surveys can in turn be used by companies to maximize the sexual health knowledge of their users.

Like bathhouses and internet hook-up sites before them, GSN apps are unquestionably here to stay in the MSM communities of the USA. However, as competition in the GSN app marketplace increases, users may demand more from GSN apps including greater investments in features that help users maximize the safety of their sexual encounters. This is best stated through the feedback of one of the survey participants, "These app[s] are interesting and I think there's definitely a market for them, I just wish there was a way to better vet the people using the app."

Given the on-going impact of HIV in the gay and bisexual male communities, GSN app providers must employ strategies to offer their services in a way that

simultaneously caters to the needs of the user base while providing each user resources specific to their individual risk profiles that protects the health of the overall sexual network. GSN apps can and should act as health resources in addition to their primary function so that they can ensure an enhanced user experience and foster greater well-being among their users.

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COMPLIANCE WITH ETHICAL STANDARDS

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