

Attractiveness, profile-picture face visibility and unprotected receptive anal intercourse in young men who have sex with men using online dating applications

Val Wongsomboon^{A,C}, Emils Sietins^B and Gregory D. Webster^A

^ADepartment of Psychology, University of Florida, 945 Center Drive, Gainesville, FL 32603, USA.

^BSchool of Public Health, Physiotherapy and Sports Science, University College Dublin, Dublin, Ireland.

^CCorresponding author. Email: v.wongsomboon@ufl.edu

Abstract. *Background:* We examined links among face visibility on dating-profile pictures, self-perceived attractiveness, condom use self-efficacy, and unprotected receptive anal intercourse (URAI) in 223 young men who have sex with men (YMSM; ages 18–24 years) using online dating applications (e.g. Grindr). *Methods:* Participants reported their face visibility on their main dating-profile picture, attractiveness, condom use self-efficacy, and frequency of URAI in the past 3 months. Number of casual sex partners and pre-exposure prophylaxis (PrEP) use were statistically controlled in all analyses. *Results:* Using a mediated moderation model, we found that a significant attractiveness-by-face-visibility interaction for URAI was fully mediated by condom use self-efficacy. Specifically, lower face visibility on profile pictures related to lower condom use self-efficacy, which in turn related to higher URAI, but only among highly attractive YMSM. *Conclusions:* Our findings suggest that attractive YMSM who show less-visible faces on their dating profiles could be at particularly high risk for sexually transmissible infections. This study has potentially important clinical implications because dating applications have become one of the most common ways for YMSM to find sexual partners.

Keywords: men who have sex with men, young adults, online dating application, face visibility, attractiveness, condom, unprotected sex, sexually transmissible infections.

Received 14 October 2020, accepted 19 February 2021, published online 19 May 2021

Introduction

Location-based online dating applications (e.g. Grindr, Tinder) have been increasingly popular among men who have sex with men (MSM) to find sexual partners, and this can potentially put them at higher risks for sexually transmissible infections (STIs).^{1–5} Young men who have sex with men (YMSM) may be especially at high risk because they tend to seek online sex and have less experience with condom use compared with older men.^{3,6,7} In addition, because YMSM tend to have sex with older men from dating applications,⁸ they may be less confident in negotiating condom use with older partners.^{9,10} Those who have receptive anal sex may experience even more power dynamics because their sexual positioning is usually perceived as passive, making it harder for them to assert condom use.^{6,9–12}

A profile picture is one of the most important features of online dating applications. Users are often selective about what to show because their profile pictures can determine their success on dating applications.^{13–15} Past research has found an association between selective self-presentation in online-

dating platforms and risky sexual behaviour, especially regarding face visibility.^{16,17} One study¹⁷ found that higher internalised homonegativity related to higher unprotected sex in gay men, but only in those who posted a profile picture with less face visibility. One possible explanation is that gay men with high self-stigma who showed less-visible faces on dating applications might have concerns about negative consequences (e.g. stigma, discrimination) if identified. These concerns, coupled with negative attitudes towards their sexual orientation, might increase their desire to find quick, anonymous sex. As a result, they might be less willing to make time and effort to assert condom use with their partners. Additionally, self-stigma and identity concealment might prevent them from receiving necessary support from the LGBTQ+ community, and research has found that loneliness is linked to increased sexual risk-taking behaviour.¹⁸ Further, men who revealed less of their faces online due to negative attitudes towards themselves might also tend to have lower self-esteem.^{19,20} If true, then they might not feel comfortable negotiating condom use with their partners.²¹

To date, no study has specifically targeted YMSM when examining the relationship between face visibility on dating-profile pictures and unprotected receptive anal intercourse (URAI). The present study examined factors associated with URAI in YMSM who used online dating applications to have casual sex. Our study specifically focussed on URAI because it is one of the highest risk factors for STIs, especially HIV/AIDS.²²

Face visibility on profile pictures alone may not predict URAI.¹⁷ Thus, we also examined the factors that might moderate or mediate the relationship between face visibility and URAI in YMSM. Past research has examined the relationship between one's attractiveness and sexual risk-taking behaviour in sexual minority men. Although evidence is still inconclusive, many studies have found that lower attractiveness and higher dissatisfaction with one's appearance are associated with increased risk of STIs.^{23–26} Sexual minority men tend to experience normative pressures to conform to beauty standards.²⁷ When these standards are unmet, they may develop negative self-concept and low psychological wellbeing, which in turn may increase their likelihood to engage in sexual risk-taking behaviours.^{19,28} In addition, although less-attractive MSM tend to have fewer sexual partners, they are also less likely to reject sexual partners and insist on condom use with their partners.²⁹

Because online dating applications are designed to prioritise physical appearance, many YMSM may experience objectification, negative comments, and rejections based on their appearance.^{14,30} Therefore, less-attractive YMSM may show less of their faces on profile pictures to avoid appearance-based judgments and rejection from other users. This choice, however, may disadvantage them on the dating market because many users avoid interacting with people who show low- or non-visible faces on their profiles.^{13,15} According to the exchange theory, which suggests that individuals bring certain assets to the sexual marketplace in bargaining for potential partners,³¹ less-attractive YMSM may feel that they have less negotiating power, including the power to negotiate condom use, in sexual relationships. In the online dating context, it is possible that less-attractive YMSM who show less-visible faces may feel that they do not have enough bargaining power to assert condom use with their sexual partners. We, therefore, hypothesised that face visibility on a dating-profile picture would interact with attractiveness, such that lower face visibility would relate to higher URAI, but only among less-attractive YMSM (Hypothesis 1).

Further, we also explored a possible mediator of the relationship between face visibility and URAI in less-attractive YMSM. Past research found that dissatisfaction with one's appearance related to lower self-efficacy for condom use.³² It is possible that less-attractive YMSM who show less of their faces have lower self-esteem and, in turn, lower condom use self-efficacy.^{33,34} Lower self-esteem and condom use self-efficacy have been shown to predict unprotected sex.^{12,35–38} Because YMSM who take a receptive role do not put a condom on their own phallus and thus rely on their insertive partner to wear a condom, lower self-esteem may result in lower confidence in asserting

condom use with a partner. Those who hold negative self-attitudes may also be less likely to value themselves and their health.¹⁹ Additionally, because condom use self-efficacy refers to people's confidence in their ability to use condoms, it stands to reason that lower condom use self-efficacy would relate to more frequent unprotected sex. Therefore, we hypothesised that lower face visibility would relate to lower self-efficacy for condom use, which in turn relates to higher URAI, but only among less-attractive YMSM (Hypothesis 2).

Despite our hypotheses, we remained open to the possibility that the effect of attractiveness would be in the opposite direction. Although we still expected the negative relationship between face visibility and URAI, it is possible that this relationship might be observed in YMSM with high (vs low) attractiveness instead. High-attractive YMSM may show less face visibility on their profile pictures because they want to avoid being identified for fear of stigmatisation.¹⁵ If true, then their vulnerability resulting from stigma and minority stress may make them become less confident in asserting condom use and more willing to take sexual risks. Another possibility is that high-attractive YMSM may show less face visibility because they just want to emphasise their body to attract more short-term sexual partners (not because they avoid being identified), which could lead to more sexual risk-taking behaviour. Thus, we also included body visibility on dating-profile pictures as a predictor for exploratory purposes. Likewise, high-attractive YMSM may show less-visible faces relative to bodies (e.g. faceless body pictures) to attract sexual partners. This difference in face and body visibility (not face visibility by itself) may predict URAI. Thus, we included face visibility in relation to body visibility (face visibility minus body visibility) in the analyses.

The present study had two objectives: (a) to understand how the interaction between face visibility on dating applications and self-perceived attractiveness predicted URAI in YMSM; and (b) to examine whether and how condom use self-efficacy mediated the relationships between face visibility, attractiveness, and URAI in YMSM. Figure 1 illustrates the hypothesised model.

Methods

Participants

The data were drawn from a larger online survey in 2019 regarding online dating behaviour in YMSM. All study protocols were approved by the University of Florida Behavioural/Non-Medical IRB (#IRB201900339). Before participating in the survey, all participants read an informed consent form explaining the study. To participate, they clicked the option indicating that they had read the informed consent and voluntarily agreed to participate in the study. They then proceeded to take the survey. Inclusion criteria for the present study were: (a) self-identifying as a man; (b) being aged 18–24 years; (c) having had sex with men; (d) having used online dating applications (e.g. Grindr); and (e) having had receptive anal sex with one or more male casual sex partners found via online dating applications in the past 3 months. All potential participants completed a pre-screener to determine

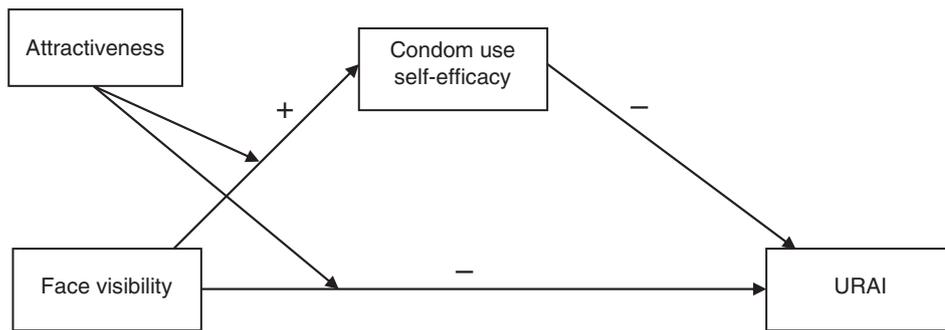


Fig. 1. Hypothesised model. URAI, unprotected receptive anal intercourse. Positive (+) signs represent positive relationships. Negative (-) signs represent negative relationships.

their eligibility. To prevent fake eligibility, participants were not informed about the inclusion criteria before pre-screening.

The sample in this study consisted of 223 YMSM aged 18–24 years (mean (M) = 21.23, s.d. = 1.92) who had receptive anal intercourse with one or more casual sex partners they met from an online dating application in the past 3 months. Participants were recruited through fliers, word-of-mouth, Facebook advertisements and Amazon’s Mechanical Turk (MTurk), targeting people in the USA. Except for participants from Amazon’s MTurk (*n* = 112; 50.2%) who received US\$1 each, the first person from every 10 eligible participants who completed the study received a US\$75 gift card for their participation. Table 1 shows demographics of the final sample.

Measures

Face and body visibility

We modified the face visibility item based on the items in Lemke and Weber¹⁶ and Sietins *et al.*¹⁷ Participants first thought about the main profile picture on their most-frequently-used dating application in the past 3 months. If they had more than one main picture, then they would pick only one that most closely represented their main profile picture. A single item asked: ‘Is your face visible in this picture?’ Participants then rated the extent to which their face was visible on that picture on a five-point scale (1 = not visible at all to 5 = completely visible). Higher scores indicated higher face visibility.

The items measuring body visibility were the same but, instead of faces, participants rated the visibility of their upper body (‘the part of your body above the waist’) and lower body (‘the part of your body below the waist’) on the same profile picture. Higher scores indicated higher upper- and lower-body visibility.

Attractiveness

Participants rated their perceived overall physical attractiveness (‘please rate your overall physical attractiveness’) on an 11-point scale (0 = not attractive at all to 10 = very attractive). Higher scores indicated higher perceived attractiveness.

Table 1. Demographic characteristics of participants

Characteristic	<i>n</i>	%
Race		
White	141	63.2
Black/African American	38	17.0
Asian	30	13.5
Native Hawaiian/Pacific Islander	2	0.9
American Indian/Alaska Native	1	0.4
Multiracial	6	2.7
Other	2	0.9
Hispanic/Latinx		
No	148	66.4
Yes	74	33.2
Education		
Less than high school	3	1.3
High school diploma	18	8.1
Some college	77	34.5
Bachelor’s Degree	98	43.9
Master’s Degree	26	11.7
PhD, MD, EdD	1	0.4
Relationship status		
Single	122	54.7
In a relationship	69	30.9
Married	27	12.1
Engaged	3	1.3
Other	1	0.4
Sexual orientation		
Bisexual	110	49.3
Homosexual	61	27.4
Heterosexual	50	22.4
Other	2	0.9
Sexual-orientation outness		
Out	155	69.5
Coming out	47	21.1
Not out	19	8.5
Sexual-positioning preference		
Versatile	90	40.4
Bottom	82	36.8
Top	50	22.4
HIV status		
HIV-negative	122	54.7
HIV-unaware	63	28.3
HIV-positive	29	13.0
PrEP use		
No	164	73.5
Yes	58	26.0

Condom use self-efficacy

We used the Self-Efficacy for Condom Use Scale³⁹ to measure condom use self-efficacy. Participants rated, on a four-point scale (1 = strongly disagree to 4 = strongly agree), their confidence in using a condom. All nine items were averaged to obtain a composite self-efficacy score. Items included ‘I can use a condom every time I have penetrative sex’ and ‘I can use a condom in any situation.’ Higher scores indicated higher condom use self-efficacy ($\alpha = 0.90$).

Unprotected receptive anal intercourse

Participants reported how many times they had unprotected receptive anal intercourse (URAI) with their casual sex partner(s) whom they met from their selected online dating application in the past 3 months. The item stated: ‘In the past 3 months, how many times did you have unprotected (condomless) receptive anal sex (you were bottoming) with your casual-sex partner(s) from [the selected application]? If you cannot remember exactly how many, please try to approximate the number as best as you can. Please write down a number (write ‘0’ if you always used a condom when you were bottoming in the past 3 months).^a Because count variables are positively skewed, the number of URAI was natural-log-transformed for analyses.

Data analysis

We ran separate mediated moderation models via a regression path analysis modelling tool called PROCESS.⁴⁰ For our hypothesised model, face visibility was an independent variable predicting URAI, with attractiveness as a moderator and condom use self-efficacy as a mediator. The main effects of attractiveness and condom use self-efficacy were also included in the model. To test the unmediated direct effects of the predictors, we also ran a moderation model without the mediator (condom use self-efficacy).

Regarding the exploratory analyses, the next two models were the same except that the independent variable was: (a) upper-body visibility in one; and (b) lower-body visibility in the other. To test whether the difference between face visibility

and body visibility predicted URAI, we subtracted each body visibility item from the face visibility item, resulting in two difference scores: (a) face visibility minus upper-body visibility; and (b) face visibility minus lower-body visibility. In the last two models, the independent variables were the two difference scores (i.e. differences between: (a) face and upper-body visibility; and (b) face and lower-body visibility, respectively).

In all models, we controlled for number of casual sex partners in the past 3 months (a 20-point scale where 1 = one partner and 20 = 20 partners or more) and pre-exposure prophylaxis (PrEP) use (yes or no). All predictors were mean centred for the analyses. Note that we did not include HIV status as one of the covariates because the number of people with HIV+ was too low (13%) and thus can make the model unreliable. Moreover, HIV status did not relate to the outcome variables and including HIV status did not change the results. Additionally, we tried controlling for relationship status, but it did not predict any outcomes. For model parsimony, we removed it from the final model.

Results

Table 2 shows bivariate correlations and means (including s.d.) for all variables. Lower face visibility, lower condom use self-efficacy, and higher attractiveness were significantly correlated with higher URAI.

Table 3 shows results from a mediated moderation. Before controlling for condom use self-efficacy, the face-visibility × attractiveness interaction significantly related to URAI (Fig. 2). Simple slopes analysis revealed that, among highly attractive YMSM (+1 s.d.), lower face visibility was associated with higher URAI ($b = -0.18$, $t(211) = -2.96$, $P = 0.004$, $r_p = -0.20$, 95% CI [-0.33, -0.07]); no significant association existed for low-attractive YMSM (-1 s.d.). After adding condom use self-efficacy as the mediator, the interaction between face visibility and attractiveness on URAI became non-significant, suggesting full statistical mediation. The indirect effect ($b = -0.02$ [-0.04, -0.01]) was significant. The conditional indirect effect at high (+1 s.d.)

Table 2. Bivariate correlations

Face-minus-upper-body visibility was calculated by subtracting upper-body visibility from face visibility (same for face-minus-lower-body visibility). PrEP use was coded as 0 (no) and 1 (yes). URAI was log-transformed. * $P < 0.05$. ** $P < 0.01$

	Mean (s.d.)	1	2	3	4	5	6	7	8	9
1. Face visibility	3.64 (1.26)									
2. Upper-body visibility	3.45 (1.12)	0.15*								
3. Lower-body visibility	2.63 (1.29)	-0.15*	0.45**							
4. Face-minus-upper-body visibility	0.19 (1.56)	0.70**	-0.60**	-0.45**						
5. Face-minus-lower-body visibility	1.01 (1.94)	0.76**	-0.20**	-0.77**	0.76**					
6. Attractiveness	8.17 (1.57)	-0.05	0.04	0.20**	-0.07	-0.17*				
7. Condom use self-efficacy	3.23 (0.62)	0.03	0.04	-0.10	-0.003	0.09	-0.03			
8. Number of sexual partners	4.15 (3.25)	-0.09	0.07	0.05	-0.13	-0.09	0.12	-0.12		
9. PrEP use	0.26 (0.44)	-0.16*	-0.03	0.11	-0.11	-0.18**	0.20**	-0.09	0.16*	
10. URAI	0.79 (0.75)	-0.16*	-0.06	0.12	-0.09	-0.18**	0.14*	-0.43**	0.32**	0.27**

^aAll participants had reported at least one receptive anal sex with casual-sex partner(s) in the past 3 months.

Table 3. Mediated moderation results

The unmediated model is the model without the mediator (condom use self-efficacy). The mediated model is the model that included the mediator. Number of sexual partners and PrEP use were entered as covariates. r_p , partial correlation; CI, confidence interval

	<i>b</i>	<i>t</i>	<i>P</i>	Effect size (r_p)	95% CI
Unmediated model					
Outcome: URAI (d.f. = 211)					
Face visibility	-0.10	-2.42	0.02	-0.16	[-0.29, -0.03]
Attractiveness	0.02	0.77	0.44	0.05	[-0.08, 0.19]
Face visibility × attractiveness	-0.05	-2.35	0.02	-0.16	[-0.29, -0.03]
Number of sexual partners	0.06	4.44	<0.001	0.29	[0.16, 0.41]
PrEP use	0.29	2.64	0.01	0.18	[0.04, 0.31]
Mediated model					
Outcome: condom use self-efficacy (d.f. = 211)					
Face visibility	0.03	0.92	0.36	0.06	[-0.07, 0.20]
Attractiveness	0.01	0.33	0.75	0.02	[-0.11, 0.16]
Face visibility × attractiveness	0.05	2.41	0.02	0.16	[0.03, 0.29]
Number of sexual partners	-0.02	-1.61	0.11	-0.11	[-0.24, 0.03]
PrEP use	-0.08	-0.75	0.45	-0.05	[-0.19, 0.08]
Outcome: URAI (d.f. = 210)					
Condom use self-efficacy	-0.44	-6.23	<0.001	-0.39	[-0.50, -0.27]
Face visibility	-0.08	-2.22	0.03	-0.15	[-0.28, -0.02]
Attractiveness	0.03	0.98	0.33	0.07	[-0.07, 0.20]
Face visibility × attractiveness	-0.03	-1.50	0.14	-0.10	[-0.24, 0.03]
Number of sexual partners	0.06	4.11	<0.001	0.27	[0.14, 0.39]
PrEP use	0.26	2.54	0.01	0.17	[0.04, 0.30]

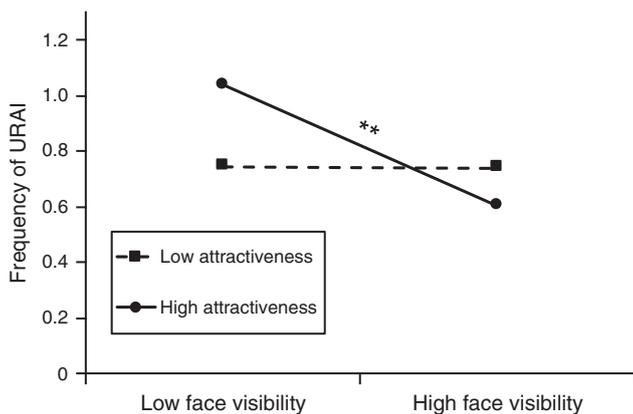


Fig. 2. Interaction between face visibility and attractiveness on unprotected receptive anal intercourse (URAI) before controlling for condom use self-efficacy (the mediator). Low = -1 s.d. and high = +1 s.d. ** $P < 0.01$.

attractiveness was also significant ($b = -0.05$, $[-0.11, -0.01]$); the same indirect effect at low attractiveness was not significant. Thus, in YMSM with high attractiveness, lower face visibility related to lower condom use self-efficacy, which in turn related to higher URAI (Fig. 3).

For exploratory purposes, we also ran the same models in which: (a) upper-body visibility; (b) lower-body visibility; (c) face-minus-upper-body visibility; and (d) face-minus-lower-body visibility, respectively, were included as an independent variable. No significant results were found in any of the four

models. Body visibility (even compared with face visibility) was not related to URAI, regardless of attractiveness level.

Discussion

Both of our hypotheses were partially supported. First, supporting Hypothesis 1, we found that less face visibility on profile pictures related to higher URAI, but only in YMSM with high (not low) attractiveness. Second, supporting Hypothesis 2, we found that condom use self-efficacy mediated the interaction between face visibility and attractiveness on URAI. Specifically, lower face visibility related to lower condom use self-efficacy, which in turn related to higher URAI, but only in YMSM with high (not low) attractiveness.

We expected, based on previous research,^{23,26} to find higher frequencies of URAI in less-attractive YMSM with lower face visibility on their profile pictures. However, existing literature still shows contradicting findings regarding the relationship between attractiveness and sexual risk-taking behaviour. Some studies, in fact, showed that higher (not lower) attractiveness and body pride related to more unprotected sex, possibly because more attractive people have more sexual opportunities.^{25,41-43} For less-attractive YMSM, it could be that selective self-presentation on dating applications is part of their mating strategy. Thus, it may not be surprising that face visibility did not predict condom use self-efficacy or URAI in YMSM with low attractiveness. For them, showing less of their faces might be a common strategy to attract more partners on dating applications, and thus had nothing to do with their proneness to sexual risks. In contrast, because more face

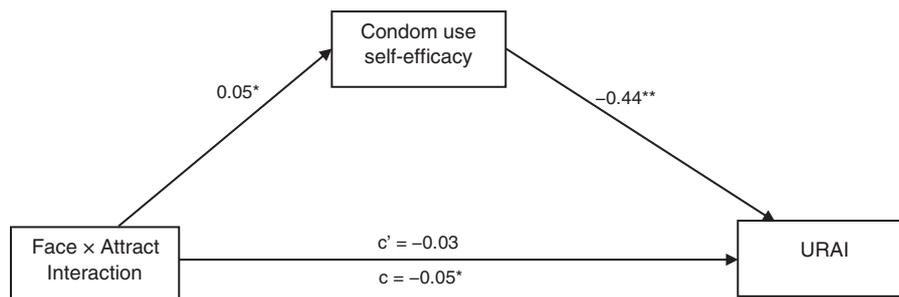


Fig. 3. Results from the mediated moderation model (only the significant mediation is shown; see Table 3 for complete model results). Face × Attract Interaction = the interaction between face visibility and attractiveness. Numbers represent unstandardised regression coefficients. *c'* = the direct effect; *c* = the unmediated effect. **P* < 0.05. ***P* < 0.01.

visibility should attract more (not fewer) partners for highly attractive YMSM, those with less-visible faces might obscure their faces on dating profiles for fear of negative consequences (e.g. stigma, shame, discrimination) from being on dating applications to seek male partners. These reasons, in turn, may explain their lower condom use self-efficacy and higher URAI.

We speculated that highly attractive YMSM with less-visible faces on their profile pictures might not want to reveal their identity because of fear of negative stereotypes or stigma such as slut-shaming.¹⁵ In addition, because most online dating applications are location-based, those in small towns or rural areas might conceal their faces to avoid being recognised by people they know, which otherwise could lead to embarrassment, conflicts with family or friends, potential job loss, or other negative consequences.¹⁵ Research has shown that more anonymous dating profiles are associated with more risky sexual behaviour, especially in men experiencing stigmatisation or internalised homonegativity.^{16,17} Therefore, many attractive YMSM who tried to conceal their identity on dating applications might be from vulnerable or at-risk populations who normally experienced discrimination or stigmatisation based on their sexual orientation. Being vulnerable might make them less assertive about condom use when having receptive anal sex. Although this could be true for all YMSM (attractive or not) with high experience of stigma, our study may help providers and educators quickly pinpoint those who may be particularly at high risk. As mentioned earlier, less-attractive YMSM may show less visible faces for many reasons (e.g. impression management, mating strategies) unrelated to stigma or shame. Thus, it may not be possible to identify them as an at-risk group based on their perceived attractiveness and face visibility. In contrast, perceiving oneself as highly attractive but showing low face visibility on dating applications could be an indicator that the person may be suffering from stigma and discrimination, and thus should be targeted for sexual health education and interventions.

It is also possible that highly attractive YMSM might show less-visible faces on their profile pictures so that they could emphasise their bodies to attract more sexual partners (not to conceal their identity). This would explain the interaction

between face visibility and attractiveness on URAI if more body visibility led to more sexual opportunities and, in turn, more sexual risks in highly attractive YMSM. However, results from another exploratory analysis showed that on average, YMSM with less face visibility also showed less (not more) of their upper bodies on their dating profiles. Moreover, the same mediated moderation analyses using body visibility or difference scores (face minus body visibility) did not yield significant results. That is, showing more body—or showing more body relative to face—on profile pictures did not predict URAI (nor was the relationship mediated by condom use self-efficacy) in highly attractive YMSM. Thus, it is unlikely that desire to emphasise one’s body (even relative to one’s face) would be a single possible explanation for higher frequencies of URAI in highly attractive YMSM with less-visible faces on their profile pictures.

Another possible explanation is that highly attractive YMSM with less-visible faces might just want to have quick sex with no strings attached. There is a tacit agreement among some users that posting low- or non-visible face pictures signals hook-up intention.¹⁵ Additionally, attractive men with high body pride might tend to have optimistic bias (perceiving themselves as being insusceptible to STIs), which, in turn, increases their willingness to engage in unsafe sex.²⁵ If so, then highly attractive YMSM in our study might have reported lower condom use self-efficacy and higher frequencies of URAI because they tended to value immediate pleasure or underestimate their chance of getting STIs, and thus simply cared less about condoms, not because they were necessarily more vulnerable or less assertive.

The present study contributes to the literature regarding sexual risk-taking behaviour in YMSM and offers some important implications. The study was the first to show the complex (non-causal) links between face visibility, attractiveness, condom use self-efficacy, and URAI in YMSM. Thus, our findings can help researchers better understand sexual risk-taking behaviour in YMSM who use online dating applications. In addition, because using dating applications to find sexual partners is common among YMSM,

to implement effective intervention and prevention strategies, educators and practitioners should consider targeting populations at higher risks for STIs among those users (e.g. attractive YMSM with less-visible faces).

Some YMSM might be afraid to seek professional help for fear of disclosing their sexual behaviour to providers, especially if they have yet identified as LGBTQ+.^{44,45} Therefore, online dating applications could promote safe sex by incorporating educational materials within the applications and specifically targeting attractive YMSM with low face visibility on their profile pictures. Local public health and social workers could also collaborate with application developers, asking them to notify those at-risk users about the closest STI testing centres.

Our study has some limitations. First, because the study was completely correlational, no causal relationships can be inferred based on the findings. Although our mediated moderation model illustrates directional arrows and the significant indirect effect was found, readers should be aware that statistical mediation need not be causal. Moreover, the results may not be generalisable to all YMSM because our study focussed only on the subpopulation of YMSM who had receptive anal sex with the partners they found from online dating applications. Additionally, all of our measures except condom use self-efficacy are one-item measures, which could result in potential loss of validity. An established multi-item scale for face (or body) visibility is needed to better test the relationship between face visibility on dating applications and unsafe sex in future research. Further, because this study focussed primarily on unprotected receptive anal intercourse (URAI), our findings may or may not generalise to unprotected insertive anal intercourse (UIAI). Future research may also examine UIAI to see if the results generalise to those who take an insertive role. Last, for the body-visibility variables, we did not measure whether the body was clothed or unclothed. This could confound our results if showing sexualised (e.g. shirtless) bodies on dating profiles predict unprotected sex in YMSM. Thus, future research should investigate the effect of showing sexualised (vs non-sexualised) bodies on dating-profile pictures.

Conclusion

We found that condom use self-efficacy fully mediated the attractiveness-by-face-visibility interaction for URAI. In other words, high-attractive YMSM with less-visible faces on their profile pictures tended to have lower condom use self-efficacy and, in turn, higher frequencies of URAI. The same results were not found when using (upper or lower) body visibility as a predictor. The findings have significant implications for research on sexual risk-taking behaviour in YMSM because they suggest that attractive young men with low face visibility on profile pictures might be especially unlikely to use condoms during receptive anal sex.

Conflicts of interest

The authors declare no conflicts of interest.

Declaration of funding

This study was supported in part by the Doug Kirby Adolescent Sexual Health Research Grant from the Rural Center for AIDS/STD Prevention (RCAP), School of Public Health, Indiana University Bloomington.

Acknowledgements

We thank Deaven Hough, the Clinical and Translational Science Institute (CTSI) at the University of Florida (UF), and the UF HealthStreet Project for their immense help with the study advertisement and recruitment of research participants.

References

- Choi EPH, Wong JYH, Fong DYT. The use of social networking applications of smartphone and associated sexual risks in lesbian, gay, bisexual, and transgender populations: a systematic review. *AIDS Care* 2017; 29(2): 145–55. doi:10.1080/09540121.2016.1211606
- Card KG, Lachowsky NJ, Cui Z, Shurgold S, Gislason M, Forrest JJ, *et al.* Exploring the role of sex-seeking apps and websites in the social and sexual lives of gay, bisexual and other men who have sex with men: a cross-sectional study. *Sex Health* 2017; 14(3): 229–37. doi:10.1071/SH16150
- Goedel WC, Duncan DT. Contextual factors in geosocial-networking smartphone application use and engagement in condomless anal intercourse among gay, bisexual, and other men who have sex with men who use Grindr. *Sex Health* 2016; 13(6): 549–54. doi:10.1071/SH16008
- Macapagal K, Moskowitz DA, Li DH, Carrión A, Bettin E, Fisher CB, *et al.* Hookup app use, sexual behavior, and sexual health among adolescent men who have sex with men in the United States. *J Adolesc Health* 2018; 62(6): 708–15. doi:10.1016/j.jadohealth.2018.01.001
- Wang H, Zhang L, Zhou Y, Wang K, Zhang X, Wu J, *et al.* The use of geosocial networking smartphone applications and the risk of sexually transmitted infections among men who have sex with men: a systematic review and meta-analysis. *BMC Public Health* 2018; 18(1): 1178. doi:10.1186/s12889-018-6092-3
- Dangerfield DT, Smith LR, Anderson JN, Bruce OJ, Farley J, Bluthenthal R. Sexual positioning practices and sexual risk among black gay and bisexual men: a life course perspective. *AIDS Behav* 2018; 22(6): 1919–31. doi:10.1007/s10461-017-1948-6
- Hospers HJ, Kok G, Harterink P, de Zwart O. A new meeting place: chatting on the Internet, e-dating and sexual risk behaviour among Dutch men who have sex with men *AIDS* 2005; 19(10): 1097–101. doi:10.1097/01.aids.0000174457.08992.62
- Macapagal K, Kraus A, Moskowitz DA, Birnholtz J. Geosocial networking application use, characteristics of app-met sexual partners, and sexual behavior among sexual and gender minority adolescents assigned male at birth. *J Sex Res* 2020; 57(8): 1078–87. doi:10.1080/00224499.2019.1698004
- Dangerfield DT, Smith LR, Williams J, Unger J, Bluthenthal R. Sexual positioning among men who have sex with men: a narrative review. *Arch Sex Behav* 2017; 46(4): 869–84. doi:10.1007/s10508-016-0738-y
- Fields EL, Bogart LM, Smith KC, Malebranche DJ, Ellen J, Schuster MA. HIV risk and perceptions of masculinity among young black men who have sex with men. *J Adolesc Health* 2012; 50(3): 296–303. doi:10.1016/j.jadohealth.2011.07.007
- Johns MM, Pingel E, Eisenberg A, Santana ML, Bauermeister J. Butch tops and femme bottoms? Sexual positioning, sexual decision making, and gender roles among young gay men. *Am J Mens Health* 2012; 6(6): 505–18. doi:10.1177/1557988312455214

- 12 Klein H. Condom use self-efficacy and HIV risk practices among men who use the internet to find male partners for unprotected sex. *Am J Men Health* 2014; 8(3): 190–204. doi:10.1177/1557988313492172
- 13 Albury K, Byron P.. Safe on My Phone? Same-sex attracted young people's negotiations of intimacy, visibility, and risk on digital hook-up apps. *Social Media +Society* 2016. 2(4): 205630511667288. doi:10.1177/2056305116672887
- 14 Anderson JR, Holland E, Koc Y, Haslam N. iObjectify: Self- and other-objectification on Grindr, a geosocial networking application designed for men who have sex with men: self- and other-objectification on Grindr. *Eur J Soc Psychol* 2018; 48(5): 600–13. doi:10.1002/ejsp.2350
- 15 Blackwell C, Birnholtz J, Abbott C. Seeing and being seen: co-situation and impression formation using Grindr, a location-aware gay dating app. *New Media Soc* 2015; 17(7): 1117–36. doi:10.1177/1461444814521595
- 16 Lemke R, Weber M. That man behind the curtain: Investigating the sexual online dating behavior of men who have sex with men but hide their same-sex sexual attraction in offline surroundings. *J Homosex* 2017; 64(11): 1561–82. doi:10.1080/00918369.2016.1249735
- 17 Sietins E, Wongsomboon V, Webster GD. Effects of internalized homonegativity and face visibility on HIV-risk-taking behaviour in gay men who had casual sex using online-dating applications. *Int J Sex Health* 2020; 32(2): 165–70. doi:10.1080/19317611.2020.1739186
- 18 DeLonga K, Torres HL, Kamen C, Evans SN, Lee S, Koopman C, et al. Loneliness, internalized homophobia, and compulsive internet Use: factors associated with sexual risk behavior among a sample of adolescent males seeking services at a community LGBT center. *Sex Addict Compulsivity* 2011; 18(2): 61–74. doi:10.1080/10720162.2011.581897
- 19 Amola O, Grimmitt MA. Sexual identity, mental health, HIV risk behaviors, and internalized homophobia among black men who have sex with men. *J Couns Dev* 2015; 93(2): 236–46. doi:10.1002/j.1556-6676.2015.00199.x
- 20 Preston DB, D'Augelli AR, Kassab CD, Starks MT. The Relationship of Stigma to the Sexual Risk Behavior of Rural Men Who Have Sex with Men. *AIDS Educ Prev* 2007; 19(3): 218–30. doi:10.1521/aeap.2007.19.3.218
- 21 Michael S, Soskolne V. Internalized homophobia and sexual risk behavior among HIV-infected men who have sex with men in Israel. *Soc Work Health Care* 2020; 59(9–10): 709–24.
- 22 Patel P, Borkowf CB, Brooks JT, Lasry A, Lansky A, Mermin J. Estimating per-act HIV transmission risk: a systematic review. *AIDS* 2014; 28(10): 1509–19. doi:10.1097/QAD.000000000000298
- 23 Blashill AJ, Goshe BM, Robbins GK, Mayer KH, Safren SA. Body image disturbance and health behaviors among sexual minority men living with HIV. *Health Psychol* 2014; 33(7): 677–80. doi:10.1037/hea0000081
- 24 Brennan D, Souleymanov R, George C, Newman P, Hart T, Asakura K, et al. Masculinity, muscularity, and HIV sexual risk among gay and bisexual men of color. *Psychol Men Masc* 2015; 16: 393–403. doi:10.1037/a0038725
- 25 Meanley S, Hickok A, Johns MM, Pingel ES, Bauermeister JAB. Body mass index, body esteem, and unprotected receptive anal intercourse among young men who have sex with men who seek partners online. *Arch Sex Behav* 2014; 43(4): 735–44. doi:10.1007/s10508-013-0159-0
- 26 Wilton L. A preliminary study of body image and HIV sexual risk behavior in black gay and bisexual men: implications for HIV prevention. *J Gay Lesb Soc Serv* 2009; 21(4): 309–25. doi:10.1080/10538720802497829
- 27 Frederick D, Essayli J.. Male body image: the roles of sexual orientation and body mass index across five national U.S. studies. *Psychol Men Masculinities* 2016; 17(4): 336–51. doi:10.1037/men0000031
- 28 Brennan DJ, Craig SL, Thompson DEA. Factors associated with a drive for muscularity among gay and bisexual men. *Cult Health Sex* 2012; 14(1): 1–15. doi:10.1080/13691058.2011.619578
- 29 Moskowitz DA, Seal DW. Revisiting obesity and condom use in men who have sex with men. *Arch Sex Behav* 2010; 39(3): 761–5. doi:10.1007/s10508-009-9478-6
- 30 Filice E, Raffoul A, Meyer SB, Neiterman E. The influence of Grindr, a geosocial networking application, on body image in gay, bisexual and other men who have sex with men: an exploratory study. *Body Image* 2019; 31: 59–70. doi:10.1016/j.bodyim.2019.08.007
- 31 Downing MJ, Schrimshaw EW. Self-presentation, desired partner characteristics, and sexual behavior preferences in online personal advertisements of men seeking non-gay-identified men. *Psychol Sex Orientat Gend Divers* 2014; 1(1): 30–9. doi:10.1037/sgd0000022
- 32 Blashill AJ, Safren SA. Body dissatisfaction and condom use self-efficacy: a meta-analysis. *Body Image* 2015; 12: 73–7. doi:10.1016/j.bodyim.2014.10.002
- 33 Beren SE, Hayden HA, Wilfley DE, Grilo CM. The influence of sexual orientation on body dissatisfaction in adult men and women. *I Int J Eat Disord*. 1996; 20(2): 135–41. doi:10.1002/(SICI)1098-108X(199609)20:2<135::AID-EAT3>3.0.CO;2-H
- 34 Bryan A, Aiken LS, West SG. HIV/STD risk among incarcerated adolescents: optimism about the future and self-esteem as predictors of condom use self-efficacy. *J Appl Sociol* 2004; 34(5): 912–36.
- 35 Colón RM, Wiatrek DE, Evans RI. The relationship between psychosocial factors and condom use among African-American adolescents. *Adolescence* 2000; 35(139): 559–69.
- 36 Molitor F, Ruiz JD. Safer sex communication and unsafe sexual behavior among young men who have sex with men in California. *Arch Sex Behav* 1999; 28: 335–43. doi:10.1023/A:1018748729070
- 37 Paul JP, Stall R, Davis F. Sexual risk for HIV transmission among gay/bisexual men in substance-abuse treatment. *AIDS Educ Prev* 1993; 5(1): 11–24.
- 38 Widman L, Noar SM, Choukas-Bradley S, Francis DB. Adolescent sexual health communication and condom use: a meta-analysis. *Health Psychol* 2014; 33(10): 1113–24. doi:10.1037/hea0000112
- 39 Mausbach BT, Semple SJ, Strathdee SA, Zians J, Patterson TL. Efficacy of a behavioral intervention for increasing safer sex behaviors in HIV-positive MSM methamphetamine users: results from the EDGE study. *Drug Alcohol Depend* 2007; 87(2-3): 249–57. doi:10.1016/j.drugalcdep.2006.08.026
- 40 Hayes AF. Introduction to mediation, moderation, and conditional process analysis: a regression-based approach. Guilford Publications; 2017. 713 p.
- 41 Allensworth-Davies D, Welles SL, Hellerstedt WL, Ross MW. Body image, body satisfaction, and unsafe anal intercourse among men who have sex with men. *J Sex Res* 2008; 45(1): 49–56. doi:10.1080/00224490701808142
- 42 Kraft C, Robinson BE, Nordstrom DL, Bockting WO, Rosser BRS. Obesity, body image, and unsafe sex in men who have sex with men. *Arch Sex Behav* 2006; 35(5): 587–95. doi:10.1007/s10508-006-9059-x
- 43 Mor Z, Parfionov K, Davidovitch N, Grotto I. Gym exercising patterns, lifestyle and high-risk sexual behaviour in men who have sex with men and in heterosexual men. *BMJ Open* 2014. 4(11): e005205. doi:10.1136/bmjopen-2014-005205
- 44 Wilson P, Santos GM, Hebert P, Ayala G. Access to HIV prevention services and attitudes about emerging strategies: a global survey of

men who have sex with men (MSM) and their health care providers. Oakland: The Global Forum on MSM & HIV (MSMGF); 2011. Available online at: <https://nyuscholars.nyu.edu/en/publications/access-to-hiv-prevention-services-and-attitudes-about-emerging-st> [verified 27 January 2021].

45 Bernstein KT, Liu K-L, Begier EM, Koblin B, Karpati A, Murrill C. Same-sex attraction disclosure to health care providers among New

York city men who have sex with men: implications for HIV testing approaches. *Arch Intern Med* 2008; 168(13): 1458–64. doi:[10.1001/archinte.168.13.1458](https://doi.org/10.1001/archinte.168.13.1458)

Handling editor: Eric Chow