*Article*

# An Emerging Risk Factor of Sexual Abuse: The Use of Smartphone Dating Applications

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### Abstract

Smartphone dating applications (apps) have become popular in recent years. However, the association between the use of dating apps and sexual abuse remains uninvestigated. The aim of this study was to examine the association between using dating apps and the sexual abuse of males and females. Six hundred sixty-six participants were recruited in four universities in Hong Kong in 2015. Overall, the 1-year prevalence of sexual abuse was 12.4% (95% confidence interval [CI]: [9.8, 14.9]) and the lifetime prevalence was 14.2% (95% CI: [11.5, 16.9]). Multiple logistic regressions found that users of dating apps (adjusted odds ratio [aOR]: 2.13, $p <$ .05) were more likely to be sexually abused in the past year than non-users. Using dating apps was also a risk factor of lifetime sexual abuse (aOR: 1.83, $p <$ .05). Our findings suggest that app users should deserve more attention in risk assessment, risk stratification, and sexual abuse prevention programs.

### Keywords

abuse, Internet, risk assessment, sexual abuse, sexual coercion

## Introduction

Far more youths than adults use the Internet, and they spend much of their time communicating through different online modalities such as websites, chat rooms, and blogs (Subrahmanyam & Greenfield, 2008). Previous studies have suggested that the

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Internet is an integral component of youths' romantic and sexual experiences (Blunt-Vinti, Wheldon, McFarlane, Brogan, & Walsh-Buhi, 2016; Mishna, McLuckie, & Saini, 2009). It is clear that this trend continues due to the increasingly mobile and portable nature of the online environment (Spielhofer, 2010).

## Internet and Sexual Abuse

Previous research studies focusing on the Internet and sexual abuse largely concentrated on children and youths because it is believed they are more susceptible to such abuse in relation to online activities (Whittle, Hamilton-Giachritsis, Beech, & Collings, 2013). A previous study in the United States found that the prevalence of unwanted sexual solicitation on the Internet was around 20% among youths (Finkelhor, Mitchell, & Wolak, 2000). The Internet provides a convenient platform for offenders to access vulnerable children and youths. Offenders first develop a relationship with the victims (including online interactions, telephone conversation, and offering gifts or money), and eventually, after the relationship is well established, victims are likely to agree to meet the offenders and even engage in sexual activities on more than one occasion (Leander, Christianson, & Granhag, 2008).

Undoubtedly, the use of technology such as the Internet can be a risk factor for victimization (Marganski & Melander, 2018). People who spend a lot of time online may expose themselves to offenders due to their increased accessibility and visibility, while providing personal information on the Internet will increase the risk of victimization because it allows abusers to monitor potential victims more closely (Marganski & Melander, 2018). The Internet can be a useful tool for sexual abusers, giving them access to potential victims over a long period of time and providing several opportunities to gain their trust and arrange offline meetings (McGrath & Casey, 2002).

In terms of sexual abuse particularly related to online dating, research studies are scarce, which makes it a difficult problem to explore. Recently, according to a report by the United Kingdom's National Crime Agency (NCA), there has been a significant increase in the number of reports to UK police forces about sexual assaults related to online dating (NCA, 2016). There are at least two theories to explain the association between the Internet and sexual abuse. First, based on O'Connell's typology of online grooming, the ease of accessibility to potential victims is a facilitator of sexual abuse (O'Connell, 2003). In the past, perpetrators most commonly abused people within their family, in the workplace, and others known to them. In contrast, the popularity of the Internet has made potential victims far more accessible to perpetrators (Brayford, Cowe, & Deering, 2013; Whittle et al., 2013). Second, as outlined by Suler's online disinhibition effect, when people engage in online interaction with others, they will sometimes share very personal information, immediately trust people they meet online and engage in risky behaviors such as talking to strangers and performing sexual acts (Suler, 2004). People who are by nature kind, generous, and trusting are at greater risk when they participate in online interactions (Whittle et al., 2013).

It is understandable that online dating will eventually progress to offline dating, especially when those involved want to develop a "real" relationship with someone

they met online. However, this progression from online to offline can pose a risk. Sexually coercive individuals might utilize these opportunities to carry out sexual abuse, with adults as well as youths susceptible to the risks.

## The Uniqueness of Dating Applications (Apps)

Today, people can easily access the Internet through smartphones, and many smartphone dating apps now use the global positioning system (GPS), such as Grindr, Jack'd, and Skout. Users of dating apps need to create a profile on which they can share their photos and their personal information, such as age, gender, ethnicity, and hobbies. One of the important features of these dating apps is to display a list of nearby users (by showing their profile picture). Users can simply click on the profile picture to view that person's personal profile and start conversations. The functions of these dating apps are versatile, allowing people to chat, share pictures, and reveal their exact location.

One qualitative study involving men who have sex with men explored their motives for using dating apps (Miller, 2015), and the respondents suggested that the apps provided a good way to arrange sexual encounters. By screening the profiles of other users, they can choose to meet and date other users in whom they are interested. They also stressed that the GPS-based technology altered the way they meet people. It allows them to identify other users nearby, thus saving them time and effort and ultimately facilitating more dates and hookups.

Dating apps undoubtedly provide a more convenient and accessible way for people to meet new friends and sexual partners (Holloway et al., 2014). In contrast, traditional online dating paradigms, websites, and chat rooms, for instance, are less handy and accessible. First, smartphone dating app users can identify people who are geographically nearby due to GPS, allowing them to arrange offline meetings more easily. Second, people who own smartphones carry the devices with them at all times. Thus, dating app users can easily access a pool of people anytime and anywhere. Third, people can download dating apps for free, while traditional dating websites often require subscription fees. However, using dating apps might increase a person's likelihood of encountering perpetrators of sexual abuse. At the same time, these apps provide a gateway for perpetrators to find opportunistic strangers with whom to carry out their own sexual desires and interests, which might lead to sexual abuse.

## The Current State of Knowledge About the Adverse Impacts of Using Dating Apps

To date, few studies have explored the health impacts of using smartphone dating apps. Furthermore, these studies exclusively examined the adverse effects of using dating apps on sexual health outcomes among men who have sex with men (Choi, Wong, & Fong, 2017). These studies suggested that the use of dating apps was associated with having more sexual partners and more unprotected sex (Choi et al., 2017). For example, one

study found that compared with non-users, dating app users reported having significantly more sexual partners in the past 1-month period, 3-month period, and over their entire life (Lehmiller & Ioerger, 2014). Another study found that the prevalence of engaging in unprotected sexual intercourse was 46.4% among dating app users (Rendina, Jimenez, Grov, Ventuneac, & Parsons, 2014), while one study found that 48% of dating app users reported alcohol or illicit drug use during sex (Landovitz et al., 2013). The findings of previous studies have several implications. First, the higher number of sexual partners among dating app users implies that using the apps was associated with having a greater number of sexual encounters. However, it should be noted that not all sexual encounters are consensual, as a study of 178 college students found that 77.8% of unwanted sex occurred in the context of such encounters (Flack et al., 2007). Second, the high prevalence of unprotected sex is worrisome because it implies some people are possibly forced to engage in unsafe sex. Third, substance use during sex is problematic. Some respondents in a qualitative study about online relationships reported that some older men use illicit drugs to entice younger women and men into sexual encounters (Mishna et al., 2009). Therefore, based on the findings of previous studies about the use of dating apps, it appears their use is associated with adverse sexual health outcomes.

## Objectives and Hypothesis

There is a dearth of research exploring the relationship between using smartphone dating apps and sexual abuse. Thus, the objective of the present study was to examine this association among college students in Hong Kong. The hypothesis was that using dating apps is associated with having a greater chance of being sexually abused.

# Method

## Setting and Subjects

This was a cross-sectional study. Subjects were recruited using convenience sampling in four main universities in Hong Kong between September and November 2015; a booth was set up in the campuses to recruit subjects. Potential participants were excluded if they could not speak or understand Chinese or English or were not university students. Bilingual field workers explained the aims, procedures, and nature of the study; obtained written consent; distributed and collected questionnaires; and answered questions raised by the students. Due to the sensitive nature of the research topic, the voluntary, anonymous, and confidential nature of the study was emphasized, including explaining that personal information (university number, study major, and year of study) would not be collected.

## Study Instruments

Subjects self-completed a coded anonymous questionnaire (available in English and Chinese) containing items on sociodemographics, the use of dating apps and experience

of sexual abuse. To diminish the effect of social disability bias, subjects were informed that they could skip any questions they did not want to answer.

*Sociodemographics.* All subjects completed a set of sociodemographic items:

- Age (a continuous ratio variable)
- Gender: male or female (a dichotomous nominal variable)
- Sexual orientation: heterosexual or bisexual/homosexual (a dichotomous nominal variable)
- Relationship status: currently in a relationship/not currently in a relationship (a dichotomous nominal variable)
- Monthly income: <HKD5,000 or ≥ HKD5,000 (a dichotomous ordinal variable)
- Smoking habits: current smoker/non-current smoker (a dichotomous nominal variable)
- Drinking habits: current drinker/non-current drinker (a dichotomous nominal variable)

Table 1 details the participants' sociodemographic information.

*Use of dating apps.* With reference to previous studies of dating apps and sexual behaviors (Bien et al., 2015; Holloway, Pulsipher, Gibbs, Barman-Adhikari, & Rice, 2015; Landovitz et al., 2013), the following questions were asked to assess the use of dating apps:

- Do you use dating apps? (yes/no)
- For how long have you used dating app(s)? (<1 month, 1–2 months, 3–12 months, > 12 months)

Study subjects were categorized as user or non-user (a dichotomous nominal variable). We also listed some examples of dating apps (such as Tinder, Skout, Grindr, and Jack'd) in the questionnaire. Furthermore, the definition of a dating app was given as a smartphone app created primarily for dating purposes; that used GPS technology, with which users can locate other users nearby; and that through which users could send text messages and photos (Beymer et al., 2014; Holloway et al., 2015). These questions were developed originally in English before being translated into Chinese by a professional translator.

*Sexual coercion subscale of revised Conflict Tactics Scales (CTS-2).* The CTS-2 was developed to measure the extent to which partners engage in intimate partner violence (Straus, Hamby, Boney-McCoy, & Sugarman, 1996). The definitions of partner can refer to a sexual partner in a hookup/casual sex relationship and to a committed partner such as a boyfriend or girlfriend. The sexual coercion subscale of CTS-2 contains seven items: (a) made me have sex without a condom, (b) insisted on sex when I did not want to (but did not use physical force), (c) pressured me to have oral or anal sex

**Table 1.** Demographic Information of Participants and Prevalence of Being Sexually Abused (*n* = 666).

| Demographic information | | |
|---|---:|---|
| Dating app use, *n* (%) | | |
| No | 312 (46.85) | |
| Yes | 352 (52.85) | |
| Did not answer | 2 (0.30) | |
| Dating app use, *n* (%) | | |
| No | 312 (46.85) | |
| Using dating apps <1 month | 13 (1.95) | |
| Using dating apps 1-2 months | 17 (2.55) | |
| Using dating apps 3-12 months | 33 (4.59) | |
| Using dating apps >12 months | 287 (43.09) | |
| Did not answer | 4 (0.60) | |
| Age, *M* (*SD*) | 20.03 (1.52) | |
| Sexuality, *n* (%) | | |
| Heterosexual female | 297 (44.59) | |
| Heterosexual male | 247 (37.08) | |
| Bisexual/homosexual female | 62 (9.30) | |
| Bisexual/homosexual male | 49 (7.36) | |
| Did not answer | 11 (1.65) | |
| Relationship status, *n* (%) | | |
| Not currently in a relationship | 190 (28.53) | |
| Currently in a relationship | 476 (71.47) | |
| Monthly income, *n* (%) | | |
| <HKD5,000 | 525 (78.83) | |
| ≥HKD5,000 | 127 (19.07) | |
| Did not answer | 14 (2.10) | |
| Smoking status, *n* (%) | | |
| Non-current smoker | 636 (95.50) | |
| Current smoker | 28 (4.20) | |
| Did not answer | 2 (0.30) | |
| Drinking status, *n* (%) | | |
| Non-current drinker | 359 (53.90) | |
| Current drinker | 305 (45.80) | |
| Did not answer | 2 (0.30) | |
| **Prevalence of being sexually abused** | ***n* (%)** | **95% CI** |
| One-year prevalence | | |
| Being sexually abused | 80 (12.36) | [9.82, 14.90] |
| Q1. Made me have sex without a condom | 54 (8.35) | [6.22, 10.48] |
| Q2. Insisted on sex when I did not want to (but did not use physical force) | 49 (7.57) | [5.53, 9.61] |

**Table 1. (continued)**

| Prevalence of being sexually abused | *n* (%) | 95% CI |
|---|---|---|
| Q3. Pressured me to have oral or anal sex (but did not use physical force) | 42 (6.49) | [4.59, 8.39] |
| Q4. Used force to make me have oral or anal sex | 3 (0.46) | [0.00, 0.98] |
| Q5. Used force to make me have sex | 4 (0.62) | [0.02, 1.22] |
| Q6. Used threats to make me have oral or anal sex | 6 (0.93) | [0.19, 1.67] |
| Q7. Used threats to make me have sex. | 8 (1.24) | [0.39, 2.09] |
| Lifetime prevalence | | |
| Being sexually abused | 92 (14.22) | [11.53, 16.91] |
| Q1. Made me have sex without a condom | 61 (9.43) | [7.18, 11.68] |
| Q2. Insisted on sex when I did not want to (but did not use physical force) | 59 (9.12) | [6.9, 11.34] |
| Q3. Pressured me to have oral or anal sex (but did not use physical force) | 52 (8.04) | [5.94, 10.14] |
| Q4. Used force to make me have oral or anal sex | 3 (0.46) | [0.00, 0.98] |
| Q5. Used force to make me have oral sex | 5 (0.77) | [0.1, 1.44] |
| Q6. Used threats to make me have oral or anal sex | 7 (1.08) | [0.28, 1.88] |
| Q7. Used threats to make me have sex. | 10 (1.55) | [0.6, 2.5] |

(but did not use physical force), (d) used force to make me have oral or anal sex, (e) used force to make me have oral sex, (f) used threats to make me have oral or anal sex, and (g) used threats to make me have sex. The participants were asked to indicate the frequency of occurrence of each act during the past year on a 7-point Likert scale (0 = *never happened before*; 1 = *once*; 2 = *twice*; 3 = *3 to 5 times*; 4 = *6 to 10 times*; 5 = *11 to 20 times*; 6 = *more than 20 times*). In addition to the 7-point Likert scale, there was one response option to indicate, "the act did happen before, but not in the past year."

As suggested by the original authors, the CTS-2 is an appropriate tool with which to estimate the prevalence of sexual abuse. The data for 1-year prevalence and lifetime prevalence of sexual coercion were derived according to the scoring method in the CTS-2 menu (Straus, 2004; Straus et al., 1996). According to the menu, a subject who reports one or more of the acts during the referent period in the scale is considered a victim of sexual abuse (Straus, 2004; Straus et al., 1996). The prevalence rates referred to the percentage of study subjects who indicated one or more of the items on the scale.

We chose the CTS-2 to measure sexual coercion for several reasons. First, the original authors developed the questionnaire for university students (Straus et al., 1996), suggesting that it is relevant and applicable to our study sample. Second, unlike most of the questionnaires on abuse experience that are disproportionately developed for women only, the CTS-2 is not gender-specific in terms of those completing the questionnaire or their partners, and is thus applicable to both men and women with different sexual orientations. Third, it can measure three levels of sexual abuse, namely, insistence, threats of force, and actual force. Fourth, the CTS-2 has commonly been used in many different countries, including with Chinese populations (Chan, Straus, Brownridge, Tiwari, & Leung, 2008).

### Sample Size Calculation

The sample size was calculated to estimate the prevalence of dating app use. An epidemiological study in mainland China found that their prevalence of use was 40.1% (Bien et al., 2015). Using this as a reference point, a minimum overall sample of 369 subjects was needed to achieve a 5% maximum error. The sample size calculation was carried out using Epi Info 7.0 (Dean et al., 2007).

### Statistical Analysis

The 1-year prevalence and lifetime prevalence of sexual abuse were estimated. Simple and multiple logistic regression analyses were conducted to identify factors associated with the 1-year prevalence and lifetime prevalence of sexual abuse, respectively. To examine the association between using dating apps and the specific acts of sexual abuse as measured by the CTS-2, each individual item of the CTS-2 was entered in a multiple logistic regression model as a dependent variable. The adjusted odds ratios (aORs) with a 95% CI were reported.

The Hosmer & Lemeshow Test was used to assess the model fit of multiple logistic regressions (Hosmer & Lemeshow, 2004). Multicollinearity diagnostics were performed for all regression models. In each regression model, only subjects providing full data were included in the analysis, and imputation or other substitution methods were not used. All statistical analyses were conducted using SPSS 23, with $p$ values < .05 indicating statistical significance.

### Ethics Approvals

The study protocol was approved by the institutional review boards of the universities involved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee, and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants in the study.

## Results

Six hundred seventy-six people answered the study questionnaire. Of these, 10 people were excluded because they indicated that they were not college students. Of the 666 subjects recruited in this study, 52.9% were using dating apps. The mean age was 20.0 (*SD*: 1.5); 9.3% of the participants were bisexual/lesbians, while 7.4% were bisexual/gay men. The demographic information is provided in Table 1.

### One-Year Prevalence of Sexual Abuse

Overall, the 1-year prevalence of sexual abuse was 12.4%. Specifically, 8.4% of subjects reported that their partners made them have sex without a condom; 7.6% reported

that their partners insisted on sex when they did not want to, but did not use any physical force; 6.5% reported that their partners pressured them to have oral or anal sex but did not use any physical force; 0.5% reported that their partners used force to make them have oral or anal sex; 0.6% reported that their partners used force to make them have sex; 0.9% reported that their partners used threats to make them have oral or anal sex; and 1.2% reported that their partners used threats to make them have sex. The results are shown in Table 1.

The results of a multiple logistic regression model (Model 1 in Table 2) found that users of dating apps (aOR: 2.13; 95% CI: [1.21, 3.76]), older subjects (aOR: 1.24; 95% CI: [1.05, 1.47]), and bisexual/homosexual males (aOR: 4.74; 95% CI: [2.13, 10.57]) were more likely to be sexually abused in the past year. The duration of dating app use was inputted into the regression model for further analysis (Model 2 in Table 2). It was found that using dating apps for more than a year was a risk factor associated with sexual abuse (aOR: 2.16, 95% CI: [1.28, 3.66]).

Further analysis revealed that factors associated with being forced by partners to have sex without a condom included using dating apps (aOR: 2.09, 95% CI: [1.02, 4.28]), being older (aOR: 1.29, 95% CI: [1.06, 1.58]), and being a bisexual/homosexual male (aOR: 6.15, 95% CI: [2.48, 15.22]). The result is shown in Model 3 in Table 3. Using dating apps for more than a year was also a risk factor associated with being forced by partners to have sex without a condom (aOR: 2.06, 95% CI: [1.08, 3.93]). The result is shown in Model 4 in Table 3.

Factors associated with partners insisting on sex without using any physical force included being a bisexual/homosexual male (aOR: 3.56, 95% CI: [1.35, 9.40]) and being a bisexual/homosexual female (aOR: 2.97, 95% CI: [1.13, 7.76]). The result is shown in Model 5 in Table 3. Factors associated with partners insisting on oral or anal sex without using any physical force included being a heterosexual female (aOR: 2.62, 95% CI: [1.13, 6.07]), a bisexual/homosexual male (aOR: 4.55, 95% CI: [1.59, 13.00]), and a smoker (aOR: 3.67, 95% CI: [1.21, 11.15]). The result is shown in Model 7 in Table 3.

## Lifetime Prevalence of Sexual Abuse

Overall, the lifetime prevalence of sexual abuse was 14.2%. Specifically, 9.4% of the subjects reported that their partners made them have sex without a condom, 9.1% reported that their partners insisted on sex when they did not want to but did not use any physical force, 8.0% reported that their partners insisted they have oral or anal sex but did not use any physical force, 0.5% reported that their partners used force to make them have oral and anal sex, 0.8% reported that their partners used force to make them have sex, 1.1% reported that their partners used threats to make them have oral or anal sex, and 1.6% reported that their partners used threats to make them have sex. The results are shown in Table 1.

The results of multiple logistic regression models found that factors associated with lifetime sexual abuse included using dating apps (aOR: 1.83, 95% CI: [1.07, 3.13]), being older (aOR: 1.28, 95% CI: [1.09, 1.52]), and being a bisexual/homosexual male (aOR: 9.05, 95% CI: [4.15, 19.70]). The result is shown in Model 9 in Table 4.

**Table 2.** Factors Associated With Being Sexually Abused (1-Year).

| | Not being sexually abused | Being sexually abused | Simple logistic regression | | Multiple logistic regression Model 1 (n = 622) | | Multiple logistic regression Model 2 (n = 622) | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
| Dating app use | | | | | | | | |
| No | 284 (50.18) | 20 (25) | 1.00 | | 1.00 | | N/A | |
| Yes | 282 (49.82) | 60 (75) | 3.02 [1.77, 5.14] | <.01 | 2.13 [1.21, 3.76] | .01 | | |
| Dating app use, n (%) | | | | | | | | |
| Non-users/Using dating apps ≤12 months | 338 (59.72) | 27 (33.75) | 1.00 | | N/A | | 1.00 | |
| Using dating apps >12 months | 228 (40.28) | 53 (66.25) | 2.92 [1.78, 4.78] | <.01 | 1.24 [1.05, 1.47] | .01 | 2.16 [1.28, 3.66] | <.01 |
| Age, M (SD) | 19.95 (1.47) | 20.60 (1.67) | 1.30 [1.12, 1.50] | <.01 | | | 1.23 [1.04, 1.46] | .02 |
| Sexuality, n (%) | | | | | | | | |
| Heterosexual male | 221 (39.61) | 19 (24.05) | 0.48 [0.28, 0.83] | .01 | 1.00 | | 1.00 | |
| Heterosexual female | 256 (45.88) | 32 (40.51) | 0.80 [0.50, 1.30] | .37 | 1.77 [0.95, 3.30] | .07 | 1.77 [0.95, 3.31] | .07 |
| Bisexual/homosexual male | 30 (5.38) | 19 (24.05) | 5.57 [2.96, 10.50] | <.01 | 4.74 [2.13, 10.57] | <.01 | 5.11 [2.29, 11.40] | <.01 |
| Bisexual/homosexual female | 51 (9.14) | 9 (11.39) | 1.28 [0.60, 2.71] | .52 | 1.94 [0.78, 4.82] | .16 | 2.01 [0.81, 5.01] | .13 |
| Relationship status, n (%) | | | | | | | | |
| Not currently in a relationship | 154 (27.16) | 20 (25) | 1.00 | | 1.00 | | 1.00 | |
| Currently in a relationship | 413 (72.84) | 60 (75) | 1.12 [0.65, 1.92] | .68 | 1.25 [0.69, 2.26] | .47 | 1.21 [0.67, 2.18] | .53 |

**Table 2. (continued)**

| | Not being sexually abused | Being sexually abused | Simple logistic regression | | Multiple logistic regression | | Multiple logistic regression | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Model 1 (n = 622) | | Model 2 (n = 622) | |
| | | | OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
| Monthly income, n (%) | | | | | | | | |
| <HKD5,000 | 456 (82.01) | 53 (67.09) | 1.00 | | 1.00 | | 1.00 | |
| ≥HKD5,000 | 100 (17.99) | 26 (32.91) | 2.24 [1.33, 3.75] | <.01 | 1.36 [0.73, 2.53] | .33 | 1.35 [0.72, 2.52] | .34 |
| Smoking status, n (%) | | | | | | | | |
| Non-current smoker | 545 (96.46) | 72 (90) | 1.00 | | 1.00 | | 1.00 | |
| Current smoker | 20 (3.54) | 8 (10) | 3.03 [1.29, 7.13] | .01 | 1.27 [0.46, 3.51] | .65 | 1.30 [0.46, 3.65] | .62 |
| Drinking status, n (%) | | | | | | | | |
| Non-current drinker | 315 (55.75) | 33 (41.25) | 1.00 | | 1.00 | | 1.00 | |
| Current drinker | 250 (44.25) | 47 (58.75) | 1.79 [1.12, 2.89] | .02 | 1.47 [0.86, 2.50] | .16 | 1.46 [0.85, 2.49] | .17 |

*Note.* The outcome of the regression models was sexual abuse as measured by the sexual coercion subscale of revised Conflict Tactics Scales.
Model 1: Model chi-square = 50.209, *df* = 9, *p* < .001; Nagelkerke $R^2$ = .146; Hosmer & Lemeshow Test, chi-square = 6.345, *df* = 8, *p* = .609.
Model 2: Model chi-square = 51.478, *df* = 9, *p* < .001; Nagelkerke $R^2$ = .150; Hosmer & Lemeshow Test, chi-square = 5.780, *df* = 8, *p* = .672.
All variance inflation factors < 2. OR = odds ratio; CI = confidence interval.

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**Table 3.** Further Analysis to Explore Factors Associated With Being Sexually Abused (1 Year).

| | Multiple logistic regression | | | | | | | | | | | |
| | Made me have sex without a condom | | | | Insisted on sex when I did not want to (but did not use physical force) | | | | Pressured me to have oral or anal sex (but did not use physical force) | | | |
| | Model 3 (n = 622) | | Model 4 (n = 622) | | Model 5 (n = 622) | | Model 6 (n = 622) | | Model 7 (n = 622) | | Model 8 (n = 622) | |
| | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dating app use** | | | | | | | | | | | | |
| No | 1.00 | | N/A | | 1.00 | | N/A | | 1.00 | | N/A | |
| Yes | 2.09 [1.02, 4.28] | .04 | | | 1.71 [0.86, 3.39] | .13 | | | 1.42 [0.69, 2.94] | .34 | | |
| **Dating app use, n (%)** | | | | | | | | | | | | |
| Non-users/Using dating apps ≤12 months | N/A | | 1.00 | | N/A | | 1.00 | | N/A | | 1.00 | |
| Using dating apps >12 months | | | 2.06 [1.08, 3.93] | .03 | | | 1.84 [0.97, 3.51] | .06 | | | 1.49 [0.75, 2.93] | .25 |
| Age, M (SD) | 1.29 [1.06, 1.58] | .01 | 1.28 [1.04, 1.57] | .02 | 1.17 [0.95, 1.44] | .14 | 1.16 [0.94, 1.43] | .17 | 1.12 [0.90, 1.40] | .31 | 1.11 [0.89, 1.39] | .36 |
| **Sexuality, n (%)** | | | | | | | | | | | | |
| Heterosexual male | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Heterosexual female | 1.73 [0.80, 3.77] | .17 | 1.75 [0.80, 3.81] | .16 | 1.28 [0.59, 2.80] | .53 | 1.27 [0.58, 2.79] | .55 | 2.62 [1.13, 6.07] | .02 | 2.63 [1.13, 6.11] | .02 |
| Bisexual/homosexual male | 6.15 [2.48, 15.22] | <.01 | 6.61 [2.67, 16.31] | <.01 | 3.56 [1.35, 9.40] | .01 | 3.68 [1.40, 9.69] | .01 | 4.55 [1.59, 13.00] | <.01 | 4.66 [1.64, 13.24] | <.01 |
| Bisexual/homosexual female | 1.90 [0.62, 5.85] | .26 | 1.97 [0.64, 6.07] | .24 | 2.97 [1.13, 7.76] | .03 | 3.05 [1.17, 8.00] | .02 | 0.87 [0.18, 4.27] | .86 | 0.90 [0.18, 4.40] | .90 |
| **Relationship status, n (%)** | | | | | | | | | | | | |
| Not currently in a relationship | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Currently in a relationship | 1.08 [0.54, 2.20] | .82 | 1.04 [0.52, 2.10] | .91 | 1.16 [0.56, 2.36] | .69 | 1.13 [0.56, 2.31] | .73 | 1.03 [0.49, 2.15] | .95 | 1.00 [0.48, 2.09] | 1.00 |

*(continued)*

**Table 3. (continued)**

|  | Multiple logistic regression | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | Made me have sex without a condom | | | | Insisted on sex when I did not want to (but did not use physical force) | | | | Pressured me to have oral or anal sex (but did not use physical force) | | | |
|  | Model 3 (n = 622) | | Model 4 (n = 622) | | Model 5 (n = 622) | | Model 6 (n = 622) | | Model 7 (n = 622) | | Model 8 (n = 622) | |
|  | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
| Monthly income, n (%) | | | | | | | | | | | | |
| <HKD5,000 | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| ≥HKD5,000 | 1.85 [0.92, 3.74] | .09 | 1.84 [0.91, 3.74] | .09 | 0.97 [0.44, 2.15] | .94 | 0.95 [0.43, 2.13] | .91 | 0.87 [0.37, 2.05] | .75 | 0.87 [0.37, 2.07] | .76 |
| Smoking status, n (%) | | | | | | | | | | | | |
| Non-current smoker | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Current smoker | 1.30 [0.43, 3.96] | .64 | 1.34 [0.44, 4.13] | .61 | 1.58 [0.49, 5.06] | .44 | 1.59 [0.49, 5.11] | .44 | 3.67 [1.21, 11.15] | .02 | 3.70 [1.22, 11.25] | .02 |
| Drinking status, n (%) | | | | | | | | | | | | |
| Non-current drinker | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | | 1.00 | |
| Current drinker | 1.53 [0.79, 2.94] | .21 | 1.52 [0.79, 2.92] | .21 | 1.03 [0.53, 1.98] | .93 | 1.02 [0.53, 1.97] | .95 | 1.54 [0.76, 3.13] | .23 | 1.54 [0.76, 3.14] | .23 |

*Note.* The outcome of Model 4 and Model 5 was the Item 1 of the sexual coercion subscale of revised Conflict Tactics Scales. The outcome of Model 6 and Model 7 was the Item 2 of the sexual coercion subscale of revised Conflict Tactics Scales. The outcome of Model 8 and Model 9 was the Item 3 of the sexual coercion subscale of revised Conflict Tactics Scales.

Model 3: Model chi-square = 55.604, $df$ = 9, $p$ < .001; Nagelkerke $R^2$ = .194; Hosmer & Lemeshow Test, chi-square = 7.340, $df$ = 8, $p$ = .500.
Model 4: Model chi-square = 56.124, $df$ = 9, $p$ < .001; Nagelkerke $R^2$ = .195; Hosmer & Lemeshow Test, chi-square = 9.957, $df$ = 8, $p$ = .268.
Model 5: Model chi-square = 20.960, $df$ = 9, $p$ = .013; Nagelkerke $R^2$ = .080; Hosmer & Lemeshow Test, chi-square = 8.646, $df$ = 8, $p$ = .373.
Model 6: Model chi-square = 22.021, $df$ = 9, $p$ = .009; Nagelkerke $R^2$ = .084; Hosmer & Lemeshow Test, chi-square = 12.220, $df$ = 8, $p$ = .142.
Model 7: Model chi-square = 26.331, $df$ = 9, $p$ = .002; Nagelkerke $R^2$ = .106; Hosmer & Lemeshow Test, chi-square = 4.925, $df$ = 8, $p$ = .766.
Model 8: Model chi-square = 26.695, $df$ = 9, $p$ = .002; Nagelkerke $R^2$ = .108; Hosmer & Lemeshow Test, chi-square = 8.623, $df$ = 8, $p$ = .375.
All variance inflation factors < 2. OR = odds ratio; CI = confidence interval.

**Table 4.** Factors Associated With Being Sexually Abused (Lifetime).

| | Not being sexually abused | Being sexually abused | Simple logistic regression | | Multiple logistic regression Model 9 (n = 622) | |
|---|---|---|---|---|---|---|
| | | | OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
| Dating app use | | | | | | |
| No | 279 (50.36) | 25 (27.1739) | 1.00 | | 1.00 | |
| Yes | 275 (49.64) | 67 (72.83) | 2.72 [1.67, 4.43] | <.01 | 1.83 [1.07, 3.13] | .03 |
| Age, M (SD) | 19.94 (1.45) | 20.62 (1.72) | 1.31 [1.14, 1.51] | <.01 | 1.28 [1.09, 1.52] | <.01 |
| Sexuality, n (%) | | | | | | |
| Heterosexual male | 220 (40.22) | 20 (22.22) | 0.43 [0.25, 0.72] | <.01 | 1.00 | |
| Heterosexual female | 254 (46.44) | 34 (37.78) | 0.70 [0.44, 1.11] | .13 | 1.75 [0.96, 3.21] | .07 |
| Bisexual/homosexual male | 23 (4.2) | 26 (28.89) | 9.26 [4.99, 17.17] | <.01 | 9.05 [4.15, 19.70] | <.01 |
| Bisexual/homosexual female | 50 (9.14) | 10 (11.11) | 1.24 [0.61, 2.55] | .55 | 2.09 [0.87, 5.01] | .10 |
| Relationship status, n (%) | | | | | | |
| Not currently in a relationship | 150 (27.03) | 24 (26.09) | 1.00 | | 1.00 | |
| Currently in a relationship | 405 (72.97) | 68 (73.91) | 1.05 [0.64, 1.73] | .85 | 1.16 [0.65, 2.06] | .61 |
| Monthly income, n (%) | | | | | | |
| <HKD5,000 | 448 (82.35) | 61 (67.03) | 1.00 | | 1.00 | |
| ≥HKD5,000 | 96 (17.65) | 30 (32.97) | 2.30 [1.41, 3.74] | <.01 | 1.32 [0.72, 2.41] | .36 |
| Smoking status, n (%) | | | | | | |
| Non-current smoker | 534 (96.56) | 83 (90.22) | 1.00 | | 1.00 | |
| Current smoker | 19 (3.44) | 9 (9.78) | 3.05 [1.33, 6.96] | .01 | 1.15 [0.41, 3.24] | .79 |
| Drinking status, n (%) | | | | | | |
| Non-current drinker | 309 (55.88) | 39 (42.39) | 1.00 | | 1.00 | |
| Current drinker | 244 (44.12) | 53 (57.61) | 1.72 [1.10, 2.69] | .02 | 1.31 [0.78, 2.19] | .30 |

*Note.* The outcome of the regression models was sexual abuse as measured by the sexual coercion subscale of revised Conflict Tactics Scales.
Model 9: Model chi-square = 70.980, $df$ = 9, $p$ < .001; Nagelkerke $R^2$ = .193; Hosmer & Lemeshow Test, chi-square = 5.065, $df$ = 8, $p$ = .751. All variance inflation factors < 2.
OR = odds ratio; CI = confidence interval.

Further analysis found that factors associated with being forced by partners to have sex without a condom included using dating apps (aOR: 2.08, 95% CI: [1.04, 4.16]), being older (aOR: 1.31, 95% CI: [1.07, 1.60]), being a bisexual/homosexual male (aOR: 11.08, 95% CI: [4.59, 26.76]), and having a higher income (aOR: 2.00, 95% CI: [1.01, 3.95]). The result is shown in Model 10 in Table 5. Factors associated with partners insisting on sex without using any physical force included being older (aOR: 1.31, 95% CI: [1.08, 1.58]) and being a bisexual/homosexual male (aOR: 5.32, 95% CI: [2.20, 12.87]). The result is shown in Model 11 in Table 5. Factors associated with partners insisting on oral or anal sex without using any physical force included being older (aOR: 1.23, 95% CI: [1.00, 1.50]), being a heterosexual female (aOR: 2.39, 95% CI: [1.07, 5.31]), and being a bisexual/homosexual male (aOR: 7.62, 95% CI: [2.97, 19.52]). The result is shown in Model 12 in Table 5.

We found no significant interaction effects between using dating apps and gender on 1-year sexual abuse and lifetime sexual abuse, respectively (data not shown). Further analyses were not conducted for Items 4 to 7 of the CTS-2 because of the small sample size. In terms of the results of multicollinearity diagnostics, all variance inflation factors were < 2 in all multiple logistic regression models.

## Discussion

To the best of our knowledge, this is the first study examining the association between using smartphone dating apps and sexual abuse experiences, and the first study to assess the negative impacts of using dating apps among a sample with various sexual orientations. A survey of participants with different sexual orientations such as this provides more accurate and actionable information than surveys only involving selected sexual orientations, such as homosexual men.

We found that the 1-year prevalence of sexual abuse was 12.4%, a result very similar to that of a previous study conducted in Hong Kong. That study found that the prevalence of dating partner sexual violence as measured by the CTS-2 was 13.0% in college students in Hong Kong (Chan et al., 2008). Moreover, it was reassuring that the 1-year prevalence of sexual abuse in our study sample was lower than that found in well-developed countries such as Canada (28.4%), the United States (31.8%), and the United Kingdom (24.2%) (Chan et al., 2008).

Before discussing the implications of the study findings, we must acknowledge the limitations of the CTS-2 as a generic measure to assess sexual coercion by intimate partners. It should be noted that in the present study we were not sure whether the abusers were people the respondents met through dating apps. Nonetheless, the finding that using dating apps was associated with sexual abuse victimization deserves our attention and raises public health concerns.

In line with our hypothesis, we found that the use of dating apps for more than a year was associated with sexual abuse within the past year. There were some possible explanations for this.

**Table 5.** Further Analysis to Explore Factors Associated With Being Sexually Abused (Lifetime).

| | Multiple logistic regression | | | | | |
|---|---|---|---|---|---|---|
| | Made me have sex without a condom | | Insisted on sex when I did not want to (but did not use physical force) | | Pressured me to have oral or anal sex (but did not use physical force) | |
| | Model 10 (n = 622) | | Model 11 (n = 622) | | Model 12 (n = 622) | |
| | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
| Dating app use | | | | | | |
| No | 1.00 | | 1.00 | | 1.00 | |
| Yes | 2.08 [1.04, 4.16] | .04 | 1.67 [0.88, 3.18] | .12 | 1.54 [0.77, 3.07] | .22 |
| Age, M (SD) | 1.31 [1.07, 1.60] | .01 | 1.31 [1.08, 1.58] | .01 | 1.23 [1.00, 1.50] | <.05 |
| Sexuality, n (%) | | | | | | |
| Heterosexual male | 1.00 | | 1.00 | | 1.00 | |
| Heterosexual female | 1.82 [0.84, 3.92] | .13 | 1.33 [0.64, 2.76] | .44 | 2.39 [1.07, 5.31] | .03 |
| Bisexual/homosexual male | 11.08 [4.59, 26.76] | <.01 | 5.32 [2.20, 12.87] | <.01 | 7.62 [2.97, 19.52] | <.01 |
| Bisexual/homosexual female | 1.91 [0.62, 5.88] | .26 | 2.57 [1.00, 6.60] | .05 | 1.20 [0.31, 4.64] | .79 |
| Relationship status, n (%) | | | | | | |
| Not currently in a relationship | 1.00 | | 1.00 | | 1.00 | |
| Currently in a relationship | 1.15 [0.57, 2.31] | .70 | 0.93 [0.49, 1.79] | .84 | 1.04 [0.51, 2.09] | .92 |
| Monthly income, n (%) | | | | | | |
| <HKD5,000 | 1.00 | | 1.00 | | 1.00 | |
| ≥HKD5,000 | 2.00 [1.01, 3.95] | <.05 | 1.20 [0.59, 2.43] | .62 | 1.15 [0.54, 2.46] | .71 |

(continued)

**Table 5. (continued)**

| | Multiple logistic regression | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Made me have sex without a condom | | Insisted on sex when I did not want to (but did not use physical force) | | Pressured me to have oral or anal sex (but did not use physical force) | |
| | Model 10 (n = 622) | | Model 11 (n = 622) | | Model 12 (n = 622) | |
| | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value | Adjusted OR (95% CI) | p value |
| Smoking status, n (%) | | | | | | |
| Non-current smoker | 1.00 | | 1.00 | | 1.00 | |
| Current smoker | 1.24 [0.40, 3.85] | .70 | 1.25 [0.41, 3.82] | .70 | 2.62 [0.89, 7.76] | .08 |
| Drinking status, n (%) | | | | | | |
| Non-current drinker | 1.00 | | 1.00 | | 1.00 | |
| Current drinker | 1.42 [0.75, 2.69] | .28 | 0.92 [0.50, 1.71] | .80 | 1.34 [0.69, 2.59] | .39 |

*Note.* The outcome of Model 11 was the Item 1 of the sexual coercion subscale of revised Conflict Tactics Scales. The outcome of Model 12 was the Item 2 of the sexual coercion subscale of revised Conflict Tactics Scales. The outcome of Model 13 was the Item 3 of the sexual coercion subscale of revised Conflict Tactics Scales.
Model 10: Model chi-square = 80.021, $df$ = 9, $p$ < .001; Nagelkerke $R^2$ = .257; Hosmer & Lemeshow Test, chi-square = 10.447, $df$ = 8, $p$ = .235.
Model 11: Model chi-square = 38.236, $df$ = 9, $p$ < .001; Nagelkerke $R^2$ = .130; Hosmer & Lemeshow Test, chi-square = 8.095, $df$ = 8, $p$ = .424.
Model 12: Model chi-square = 44.462, $df$ = 9, $p$ < .001; Nagelkerke $R^2$ = .159; Hosmer & Lemeshow Test, chi-square = 3.868, $df$ = 8, $p$ = .869.
All variance inflation factors < 2. OR = odds ratio; CI = confidence interval.

First, the users of dating apps increase their risk of meeting someone who is sexually coercive. Dating apps accelerate the accessibility a person has to others. In the past, it was not easy for offenders to identify potential victims who were not in their social network; however, dating apps undoubtedly break this boundary, allowing people to connect easily with others, thus enabling online predators to interact with potential victims. Furthermore, most users display their personal information and image on dating apps. Previous studies on chat room sex offenders reported that they would screen the user profiles of online members in order to target susceptible and vulnerable people and lure them into engaging in sexual activities (Malesky, 2007). In addition, perpetrators of sexual abuse can easily gain the trust of potential victims through dating apps. It is suggested that online relationships tend to develop more quickly than offline relationships, while the disinhibition effect suggests that some people will perform unusual acts of kindness and generosity in online environments (Suler, 2004). Another tactic used by some offenders is to provide promises of love and even marriage during the manipulation process (Marcum, 2007). As a result, people might perceive that they are already in a well-established relationship with someone they just met online, and will not regard them as strangers, despite having never met face-to-face (NCA, 2016). This high level of trust might lead people into a situation where they are vulnerable and at risk.

Besides, the routine activity theory can also explain the association between sexual abuse and using dating apps (Cohen & Felson, 1979). The theory proposed that for criminal events to occur, a motivated offender, a vulnerable victim, and the absence of a capable guardian must align in time and space (Cohen & Felson, 1979; McKillop, Brown, Wortley, & Smallbone, 2015). The theory also advocated that movement into the public domain increases people's risk for victimization (Mustaine & Tewksbury, 1999). In other words, crime such as sexual abuse might occur when opportunities arise during the course of offenders' and victims' everyday routine. In fact, technology such as dating apps can alter the opportunity structures within people's social ecologies, increasing their exposure to potential offenders (Finkelhor, Ormrod, Turner, & Hamby, 2005).

Second, it is possible that some people purposely use dating apps for sex. The anonymity of the online environment can minimize an individual's status and authority, and when online, people are more likely to speak frankly and behave inappropriately (Suler, 2004). The anonymity might foster flirtatious and sexually explicit conversations prior to an offline meeting (NCA, 2016), which means some people might have a greater expectation of sexual activity during the first offline meeting, and assume that other users of dating apps are also looking for sex (NCA, 2016). In fact, not every user intends to engage in sexual activity, and the discrepancy in the expectations of the two parties might trigger sexual abuse.

Third, it is possible that the sexual abusers were the committed partners (such as boyfriends and girlfriends) of the respondents, instead of casual partners they met on dating apps. Sexual abuse by partners might occur because they discovered the respondents were using dating apps to date others and to look for sex. Indeed, literature has reported that sexual hookups have become culturally normal among college students, with prevalence ranging from 60% to 80% (Garcia, Reiber, Massey, & Merriwether,

2012). A qualitative study on homosexual men reported that the common perception of dating apps is that they are primarily for sexual hookups (Miller, 2015). The abusers might believe their partners have been disloyal and unfaithful, and their jealousy and anger might trigger sexual abuse. Partner jealousy and controlling behaviors have been found to be associated with intimate partner sexual violence in previous studies (Gage & Hutchinson, 2006; Jenkins, 2000). A study on adolescents also suggested that their jealousy of sexual infidelity in dating relationships was a significant predictor of sexual abuse (Sesar, Pavela, Simic, Barisic, & Banai, 2012). Besides this, a partner might use sexual abuse as a tactic to control their partner; for example, the abusers might accuse and blame their partners for not loving them if they refuse to have sex (Platt & Busby, 2009).

Due to the limitation of the cross-sectional design, we cannot confirm the causal relationship between using dating apps and sexual abuse, which means it was also possible that sexual abuse victimization leads to the use of dating apps. First, sexual abuse by an intimate partner may cause the relationship to end. Therefore, victims might start using dating apps to find and date someone else, as such apps can provide an easy and accessible way for victims to meet new partners. A qualitative study on abused women reported that meeting a new man helped them recover from the victimization and reconnect with others (Smith, 2003). Thus, using dating apps might be part of the process of leaving an abusive partner, and a "positive" outcome of victims' sexual abuse.

Conversely, it is possible that using dating apps is a "sequela" of sexual abuse victimization. The adverse impacts of sexual abuse on subsequent behaviors were well documented in previous studies (Homma, Wang, Saewyc, & Kishor, 2012; Soomar, Flisher, & Mathews, 2009). Developmental traumatology suggests that overwhelming interpersonal stress, including that caused by sexual abuse, will affect the person's psychosocial development and cognitive functions. Sexual abuse perpetrated by someone known to the victim will violate their most intimate boundaries (Saewyc, Magee, & Pettingell, 2004), and while some victims of sexual abuse will avoid relationships with others due to the fear of re-victimization, some may display inappropriate self-disclosure and an extreme need for closeness (Homma et al., 2012; Kendall-Tackett, 2002). It is possible that some victims might use dating apps to fulfill their need for closeness and self-disclosure, given that the apps allow them to disclose their identity publicly and share photos (perhaps even naked photos) with others.

From a biological perspective, the neurobiological dysregulation caused by sexual abuse will also affect psychosocial and cognitive functions, which in turn leads to engaging in risky sexual behaviors. Abuse experience might create a sense of low self-esteem, low assertiveness, and powerlessness, which in turn affects a victim's ability to form and maintain a secure and stable interpersonal relationship (Homma et al., 2012; Kendall-Tackett, 2002; Saewyc et al., 2004). Dating and sex might therefore become a way to secure affection and intimacy (Homma et al., 2012). Furthermore, victims' relationship difficulties may manifest in engaging in risky sexual behaviors, such as having multiple sexual partners and regular casual sex (Briere & Elliott, 1994). It is possible that the adverse experience of sexual abuse leads victims to use dating apps pathologically to find sex and engage in risky sexual behaviors.

It is also possible that the relationship between using dating apps and sexual abuse is confounded by other unobserved variables, such as sexual risk-taking and personal traits. For example, a study on male and female college students reported that sexual sensation-seeking was associated with sexual victimization (Monks, Tomaka, Palacios, & Thompson, 2010). On the other hand, it has been suggested that sensation-seeking is associated with online dating and sex seeking (Bauermeister, Leslie-Santana, Johns, Pingel, & Eisenberg, 2011; Peter & Valkenburg, 2007). Thus, it is possible that both using dating apps and sexual abuse were expressions of a sensation-seeking trait. Further studies are required to understand the association between using dating apps and sexual abuse.

In addition to using dating apps, we found that being a sexual minority was one of the risk factors of sexual abuse. This finding was consistent with those of previous studies, and indeed is not unique to our population. For example, the National Intimate Partner and Sexual Violence Survey conducted by Centers for Disease Control and Prevention in 2011 found that the lifetime prevalence of sexual abuse was 40.2% in gay men, 47.4% in bisexual men, 20.8% in heterosexual men, 46.4% in lesbians, 74.9% in bisexual women, and 43.3% in heterosexual women (Walters, Chen, & Breiding, 2013).

## Clinical Implications

Sexual abuse is a serious public health issue because previous studies have found that victims are more likely to suffer poorer mental health (Jordan, Campbell, & Follingstad, 2010) and health-related quality of life (Krakow et al., 2002). Moreover, sexual abuse is also linked to sexually transmitted infections (STIs; Campbell et al., 2006) and pregnancy (Riggs, Houry, Long, Markovchick, & Feldhaus, 2000). In our study, we found that unwanted unprotected sex was the most common type of sexual abuse, implying that using dating apps might also indirectly increase the risk of STIs and unwanted pregnancies.

Given that we found an association between using dating apps and sexual abuse, users of dating apps should be targeted in risk assessment, stratification, and sexual abuse prevention programs. Furthermore, instead of stopping people using dating apps, which is not feasible or practical, clinicians and social workers can adopt harm-reduction approaches and develop novel interventions to promote the safe use of dating apps in response to this new risk factor. In addition to health care providers, the developers of dating apps should also take social responsibility to promote the safe use of their products. For example, reminders promoting the safe use of the apps should be sent to users regularly.

## Limitations

There were some limitations to this study. First, it was a cross-sectional study, and the causality between using dating apps and sexual abuse could not be proved. Longitudinal studies should be conducted in future to examine this causal relationship. Second, the

participants were recruited using convenience sampling in university campuses, which means the results might not be generalizable to wider populations. Probability sampling in the general population should be adopted in future studies to strengthen the external validity of the study findings. However, in order to engage subjects with diverse backgrounds we recruited at several sites. Third, all study outcomes were self-reported, which might create a source of bias. However, data on dating app usage and sexual abuse experience can only be obtained by adopting self-reported measures. Therefore, to strengthen the validity and reliability of our data, all of the questions regarding dating apps usage were adapted from previous research studies, while the CTS-2 is a well-validated measure. Further studies might need to evaluate the validity of the question items about the use of dating apps. To avoid social desirability bias, the questionnaire was self-completed by participants anonymously (Bowling, 2005), with subjects allowed to skip any question they did not want to answer.

## Conclusion

It is alarming to find an association between using dating apps and sexual abuse, suggesting that app users have a greater risk of being sexually abused. A further study should be conducted to understand the link between using dating apps and sexual abuse. With the growing popularity of dating apps and the sexual "hookup" culture, it is necessary to develop novel health promotion programs to minimize the potential harm of using dating apps and address this public health challenge.

## Authors' Note

The study received approvals by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster Joint Institutional Review Board (UW 14-290), Joint Chinese University of Hong Kong-New Territories East Cluster Clinical Research Ethics Committee (CREC Ref. No. 2015.186), City University of Hong Kong Human Subjects Ethics Sub-Committee (H000873).

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