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## A serological divide: men who have sex with men's attitudes on HIV risk reduction strategies

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### ABSTRACT

The expanding HIV risk reduction toolkit increases options for men who have sex with men (MSM), but increasing options in combination with different preferences may complicate promoting risk reduction. To investigate what strategies MSM prefer, data of 3310 participants in the online survey “Men & Sexuality” (Median age = 37 years, 320 (9.7%) HIV positive) was analysed. Questions assessed attitudes towards HIV risk reduction strategies. Participants had the most positive attitudes regarding PrEP and HIV testing, while withdrawal and strategic positioning were least preferred (all  $p$ 's < .001). Condoms were seen as acceptable to partners and effective but scored low on sexual pleasure. HIV-positive participants were more negative about condoms and more positive about viral load sorting than HIV-negative participants ( $F_{(12,3297)} = 5.09$ ,  $p < .001$ ,  $\eta_p^2 = .02$ ). Findings highlight a preference for HIV risk reduction strategies (PrEP and HIV testing) that do not diminish sexual pleasure and can be applied independent of sexual partners. A serological divide was apparent: HIV-negative MSM were less negative about condoms than HIV-positive MSM, suggesting that condom promotion remains a viable strategy for HIV-negative MSM. Taken together, results indicate a need for personalized approaches to the promotion of HIV risk reduction strategies, accounting for individual preferences and strategy effectiveness.

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HIV; men who have sex with men (MSM); sexual contexts; HIV risk reduction strategies

### Introduction

Men who have sex with men (MSM) are disproportionately affected by the global human immunodeficiency virus (HIV) epidemic, including in the Netherlands (Slurink et al., 2019). Despite the expanding HIV risk reduction toolkit, there is little research on the preferences of MSM for different HIV risk reduction strategies. As more strategies become available, preferences between sexual partners could mismatch, which may affect the enactment of risk reduction strategies. Also, risk reduction strategies differ substantially in their effectiveness (Jin et al., 2010). The preferences of MSM for risk reduction strategies remain unknown, in particular regarding the perceived impact on sexual pleasure, overlap with acceptability to sexual partners and effectiveness in preventing HIV infection.

Following the introduction of condom use as an effective HIV prevention strategy in the early days of the HIV epidemic in the 1980s, MSM have taken a leading role in actively exploring alternative HIV risk reduction strategies (Youssef, 1993), which better preserve sexual pleasure and intimacy (Golub et al., 2012). These community-originated risk reduction strategies are

known as seroadaptive behaviours (Snowden et al., 2014), and capitalize on people's knowledge of their own and/or their partners' HIV status. Therefore, regular HIV testing is increasingly recognized as an important component of HIV risk reduction (Adam et al., 2014), and guidelines encourage MSM to test for HIV at least every six months (Soa Aids Nederland, 2013).

HIV risk reduction strategies can contribute to HIV prevention by limiting exposure to the virus, reducing the probability of transmission, limiting susceptibility, or a combination of these, and much research has focused on the effectiveness of the diverse strategies. Extensive, high-quality empirical evidence has shown that condom use (Smith et al., 2015; Weller & Davis-Beatty, 2002), and PrEP use among HIV-negative MSM (Molina et al., 2015) can prevent HIV transmission. Strategic positioning (an HIV-positive person assuming a receptive sexual position during anal sex and/or an HIV-negative person assuming an insertive sexual position) is also empirically supported (Dubois-Arber et al., 2012; Parsons et al., 2005; Vittinghoff et al., 1999). More recently, there is strong evidence that if HIV is undetectable in the body it is also untransmissible ( $U = U$ ), underscoring that effective antiretroviral

treatment and relatedly viral load sorting (only having condomless anal sex with HIV-positive partners with a suppressed viral load), can also effectively prevent HIV infection (Cohen et al., 2011).

Some HIV risk reduction strategies, in particular withdrawal before ejaculation and serosorting (Dubois-Arber et al., 2012; Parsons et al., 2005; Vittinghoff et al., 1999), remain high-risk, with only a limited risk reduction benefit compared to not practicing any risk reduction at all (Vallabhaneni et al., 2012). Withdrawal entails potential high transmission risk because of the presence of HIV in pre-ejaculatory fluid and the possibility of not withdrawing soon enough (Ilaria et al., 1992). Serosorting (only having sex with someone who has the same HIV status) assumes that individuals are aware of their HIV status and disclose it. Moreover, if neither of the partners is on antiretroviral treatment (although unlikely in the Netherlands), serosorting does not take into account the possibility of reinfection with different (drug resistant) strains of HIV. In light of infrequent HIV testing, lack of HIV status disclosure, and acute HIV infections, serosorting might place HIV-negative MSM at risk of HIV (Eaton et al., 2009), and is not advocated as risk reduction strategy in the Netherlands (MantotMan, 2019).

In addition to effectiveness, other factors may influence the use of HIV risk reduction strategies. Notably, experienced sexual pleasure when using a particular HIV risk reduction strategy is an important factor that is well established as a main barrier to the consistent use of condoms (Golub et al., 2012). Furthermore, sex that entails a potential risk of HIV infection involves two or more people, and HIV risk reduction strategies hence have to be acceptable to all sexual partners involved.

Addressing the knowledge gap with respect to MSM's views of various risk reduction strategies is critical to effectively guiding the promotion of HIV risk reduction in the current context of increased options and potentially diverging preferences. Currently, sexual health education in schools does not entail extensive information on HIV risk reduction strategies for MSM. Online HIV prevention education for MSM focusses on condoms (and lubricant), viral load sorting, PrEP, and post-exposure prophylaxis (MantotMan, 2019). This information has to be accessed by MSM themselves and leaves prioritizing open to their individual interpretation and preferences. However, there are tailored advice sections with subsequent easy to access cues for action. More tailored risk reduction takes place only when MSM visit the STI clinic affording limited time for in-depth discussions on preferences and context.

The aim of the present study is to provide a novel understanding regarding attitudes of MSM on HIV risk

reduction strategies. We assessed views of MSM regarding seven HIV risk reduction strategies (condom use, withdrawal, serosorting, strategic positioning, viral load sorting, PrEP use, and HIV testing). Specifically, we assessed the perceived sexual pleasure afforded by these risk reduction strategies, their perceived acceptability to sexual partners, and their perceived effectiveness of HIV risk reduction strategies, among HIV-negative and HIV-positive MSM.

## Methods

### Study design

The Survey "Men and Sexuality" was a cross-sectional online survey of MSM in the Netherlands; a detailed description has been provided elsewhere (Den Daas et al., 2018). The survey was designed to investigate health, well-being, and sexuality of MSM. Participants who completed the questionnaire could participate in a raffle of ten €50 gift cards. The survey was accessible from February to June 2018 and was advertised on gay media, social media, and dating apps for MSM. Inclusion criteria were: identifying as male, aged 16 years or older, currently living in The Netherlands, and having had sex with men, being attracted to men or expecting to have sex with men in the future. In total 6205 MSM participated in the survey. The present analyses are restricted to participants who completed the questions on attitudes regarding HIV risk reduction strategies ( $N = 3310$ ). The Ethical Review Board of the faculty of Social and Behavioural Sciences, Utrecht University (FETC17-131) approved this study.

### Measures

HIV status was assessed by asking participants if they had ever tested for HIV, and if so the result of their last test. We categorized participants as HIV positive or HIV negative; participants who had never tested, or did not know their test result, were categorised as HIV negative.

We assessed attitudes towards seven HIV risk reduction strategies: using condoms, withdrawal (no ejaculation inside), serosorting (only having sex with someone who has the same HIV status), strategic positioning (someone who is HIV-positive assumes a receptive sexual position or someone who is HIV negative assumes an insertive position), viral load sorting (only having condomless sex with an HIV-positive partner whose virus is effectively suppressed due to treatment), using PrEP, and testing for HIV regularly. Using 5-point rating scales, participants indicated the perceived pleasure (1 = very unpleasant for sex, 5 = very pleasant for sex),

**Table 1.** Mean (*M*) and standard deviation (*SD*) of attitude scores of the pleasantness, acceptability, and effectiveness of the 7 HIV risk reduction strategies of MSM (*n* = 3310) in the Netherlands.

	Pleasurable		Acceptable		Effective		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Condom use	2.25	2.01	3.47	1.84	4.06	2.07	3.26	1.32
Withdrawal	2.63	2.07	3.22	2.01	2.91	2.59	2.92	1.55
Serosorting	3.27	2.30	3.26	2.07	3.21	2.53	3.25	1.90
Strategic positioning	2.57	1.96	2.72	1.84	2.10	2.01	2.46	1.55
Viral load sorting	3.47	2.30	3.26	2.01	3.43	2.30	3.39	1.90
Pre-exposure prophylaxis	3.81	2.19	3.63	1.96	3.86	2.07	3.77	1.78
HIV testing	3.78	2.19	3.90	2.19	3.89	2.36	3.86	1.90

perceived acceptability to their sexual partners (1 = completely unacceptable, 5 = completely acceptable), and perceived effectiveness (1 = not at all effective, 5 = very effective) of each of the HIV risk reduction strategies.

### Data analysis

We performed General Linear Model (GLM) analysis with the type of attitude (pleasure, acceptability, and effectiveness) and HIV risk reduction strategy (condoms, withdrawal, serosorting, strategic positioning, viral load sorting, PrEP, and testing) as within-subject variables, and HIV status as between-subject variable. We used Bonferroni correction for multiple comparisons. The analysis was performed using IBM SPSS for Windows (version 24).

## Results

### Participants

Participants were mostly of Dutch origin (88.1%), and highly educated (70.4%); the median age of participants was 37 years (range 16-79). MSM from all regions and major cities in the Netherlands were represented, and 320 MSM (9.7%) were HIV positive.

### Attitudes towards HIV risk reduction strategies

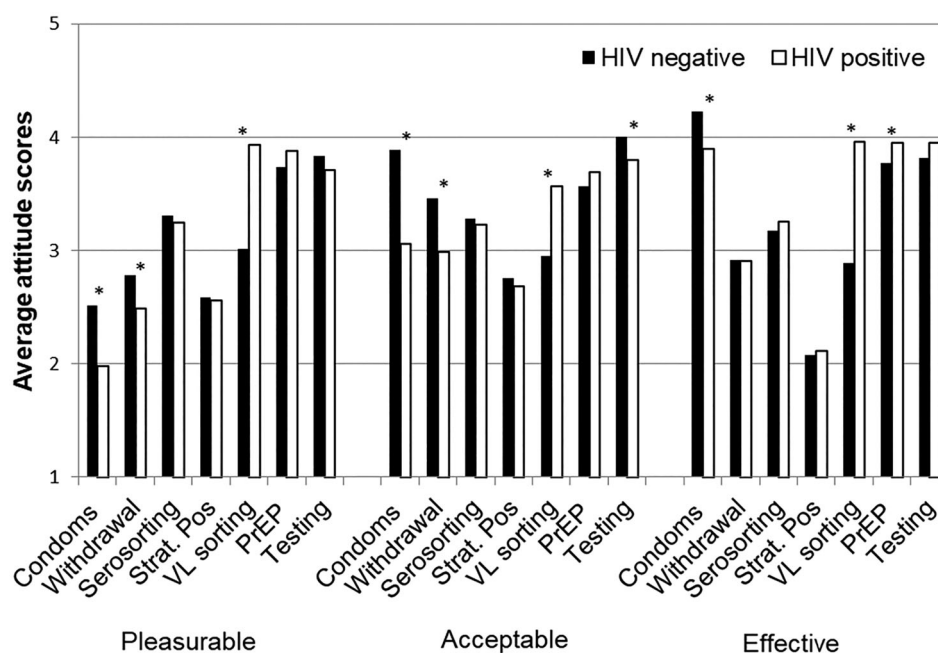
Overall, participants had neutral attitudes towards risk reduction strategies ( $M = 3.27$ ,  $SD = 0.86$ ). We found a significant difference between the overall ratings regarding pleasure, acceptability and effectiveness,  $F_{(2,3307)} = 131.32$ ,  $p < .001$ ,  $\eta_p^2 = .07$ , such that risk reduction strategies on average were rated as neutral in terms of acceptability and effectiveness ( $M = 3.35$ ,  $SD = 1.04$  and  $M = 3.35$ ,  $SD = 1.15$  respectively), while they also scored neutral but lower on pleasure ( $M = 3.11$ ,  $SD = 1.04$ ). We also found a difference in overall attitudes according to the specific risk reduction strategies,  $F_{(6,3303)} = 247.45$ ,  $p < .001$ ,  $\eta_p^2 = .31$  (Table 1, total column). Pairwise comparisons showed that participants had the most positive overall attitude about testing and PrEP, followed by viral

load sorting, condoms, and serosorting; they had the least positive attitudes regarding withdrawal, and strategic positioning.

We also found a significant interaction effect (Table 1), between attitude type (pleasure, acceptability, and effectiveness) and risk reduction strategies,  $F_{(12,3297)} = 153.73$ ,  $p < .001$ ,  $\eta_p^2 = .36$ . Pairwise comparisons showed that risk reduction strategies differed significantly in pleasure ratings ( $p$ 's  $< .001$ ). PrEP and testing scored highest and similar ( $p > .99$ ) on pleasure, followed by viral load sorting, serosorting, withdrawal and strategic positioning, that also were rated similarly ( $p > .99$ ). Condoms scored lowest on pleasure. Risk reduction strategies also differed significantly in acceptability ( $p$ 's  $< .001$ ). Testing scored highest on acceptability, followed by PrEP, condoms, and viral load sorting. Serosorting and withdrawal were rated less favourably and similarly ( $p > .99$ ); strategic positioning scored lowest on acceptability. Risk reduction strategies also differed in effectiveness ( $p$ 's  $< .001$ ). Condoms scored highest on effectiveness, followed by testing and PrEP that scored similarly ( $p > .99$ ). Viral load sorting, serosorting, strategic positioning, and withdrawal scored lowest on effectiveness.

### A serological divide in attitudes towards HIV risk reduction strategies

Overall, HIV-negative and HIV-positive participants did not differ in their attitudes towards risk reduction strategies, and both had overall neutral attitudes ( $M = 3.27$ ,  $SD = 0.58$ , and  $M = 3.28$ ,  $SD = 1.67$  respectively). There was a significant interaction between attitude type and HIV status,  $F_{(2,3307)} = 27.96$ ,  $p < .001$ ,  $\eta_p^2 = .02$ . Pairwise comparisons showed that HIV-negative participants perceived the risk reduction strategies overall as more acceptable but also as less effective compared to HIV-positive participants ( $p$ 's  $< .001$ ); there was no difference in the ratings for pleasure ( $p > .95$ ). Furthermore, there was a significant interaction between risk reduction strategies and HIV status  $F_{(6,3303)} = 47.90$ ,  $p < .001$ ,  $\eta_p^2 = .08$ . Pairwise comparisons showed that HIV-negative and HIV-



**Figure 1.** Attitudes of HIV negative ( $N = 2990$ ) and HIV positive ( $N = 320$ ) participants on the pleasantness, acceptability, and effectiveness of the HIV risk reduction strategies, namely using condoms, withdrawal, serosorting, strategic positioning, viral load sorting, using PrEP, and HIV testing. Note: \* indicates significant differences between HIV negative and positive participants ( $p < .05$  after Bonferroni adjustment). Abbreviations: HIV, human immunodeficiency virus, Strat. Pos., Strategic Positioning, VL sorting, Viral Load sorting, PrEP, pre-exposure prophylaxis.

positive participants had similar overall attitudes towards serosorting, strategic positioning, and testing. HIV-negative participants were more positive about condoms and withdrawal than HIV-positive participants ( $p$ 's  $< .001$ ), whereas HIV-positive participants were more positive about viral load sorting and PrEP than HIV-negative participants ( $p < .001$  and  $p = .02$ , respectively).

There also was a three-way interaction between attitude type, risk reduction strategy, and HIV status,  $F_{(12,3297)} = 5.09$ ,  $p < .001$ ,  $\eta_p^2 = .02$ . As shown in Figure 1, HIV-positive participants were more negative about condoms, in terms of pleasure, acceptability, and effectiveness than HIV-negative participants. HIV-positive participants were also more negative than HIV-negative participants about withdrawal in terms of pleasure and acceptability. HIV-positive participants were also more negative than HIV-negative participants with respect to the acceptability of testing. In contrast, HIV-positive participants were more positive than HIV-negative participants about viral load sorting in terms of pleasure, acceptability, and effectiveness. Lastly, HIV-positive participants were more positive than HIV-negative participants on the effectiveness of PrEP.

## Discussion

Overall attitudes towards HIV risk reduction strategies in our study are largely neutral, around the midpoint

of the response scale. This suggests at best moderate views of MSM regarding HIV risk reduction, after nearly four decades of the fight against HIV. Importantly, strategies were evaluated more positively on perceived partner acceptability and perceived effectiveness than on perceived sexual pleasure. In line with this, MSM held most favourable attitudes regarding PrEP and HIV testing, suggesting a preference for risk reduction strategies that minimally interfere with sexual pleasure and can be applied independently of sexual partners.

In addition, we observed a serological divide with respect to attitudes regarding HIV risk reduction strategies. HIV-positive MSM held more favourable views regarding PrEP and viral load sorting; biomedical risk reduction strategies requiring little action on their part. Notably, PrEP is a strategy for HIV-negative MSM, and viral load sorting only requires for their viral load to be undetectable, as was the case for 92 per cent of MSM in our sample (Den Daas et al., 2018). HIV-positive MSM were more negative about using condoms and, to a lesser extent, about withdrawal. This difference between HIV-positive and HIV-negative MSM is relevant from a public health perspective. Diverging preferences according to HIV status may pose challenges for the promotion of effective HIV risk reduction practices in sexual encounters between HIV-positive and HIV-negative MSM, in particular if HIV status is not explicitly discussed.



Another important finding is that MSM's views on the perceived effectiveness of HIV risk reduction strategies do not fully align with empirical evidence. While condom use and PrEP are proven to be highly effective strategies, MSM's attitudes were in the moderate range. Furthermore, serosorting was perceived as quite effective by both HIV-negative and HIV-positive MSM, while this strategy is not promoted as an effective risk reduction option (Dubois-Arber et al., 2012; Parsons et al., 2005; Vallabhaneni et al., 2012; Vittinghoff et al., 1999). Furthermore, HIV-negative MSM in particular perceived viral load sorting to be relatively ineffective, whereas, based on the principle that undetectable is untransmissible ( $U=U$ ), viral load sorting effectively reduces the risk of HIV infection (Cohen et al., 2011). This suggests that the  $U=U$  message does not yet resonate with many HIV-negative MSM.

In interpreting the findings several strengths and limitations have to be noted. A strength of this study is that a large number of MSM participated and provided comprehensive information on attitudes regarding HIV risk reduction strategies. Nevertheless, limitations of convenience sampling, in particular recruitment bias, need to be considered. We aimed to offset this potential bias by making use of a diversity of recruitment strategies to enrol a diverse sample of MSM. In addition, limitations of self-report surveys also need to be recognized, notably social desirability bias and memory bias. As the survey was anonymous, any social desirability bias was likely limited. Furthermore, as the focus of this study was on MSM's attitudes, memory bias would not be particularly relevant. Lastly, there was potential for attrition bias as this was an extensive survey, not all MSM who started the survey completed all questions. In line with previous research (Cheung et al., 2017), older MSM and MSM with higher education levels were more likely to complete the survey.

Furthermore, we were not able to assess attitudes about combining two or more risk reduction strategies or switching between risk reduction strategies. It is possible that attitudes differ if a combination of risk reduction strategies is considered simultaneously, for instance using PrEP as well as condoms as guidelines typically recommend. What is being observed among PrEP users is that condoms use decreases, possibly because of limited perceived effectiveness of condoms in preventing HIV over and above PrEP (Alaei et al., 2016; Hoornborg et al., 2018). Also, it is likely that attitudes are influenced by contextual information, such as HIV status of partners, familiarity with partners, and number of partners. Future research could assess to

what extend contextual factors influence attitudes regarding HIV risk reduction. In addition, future research should assess practices of MSM regarding HIV risk reduction strategies.

Our findings have several implications, there are distinct preferences for HIV risk reduction strategies between HIV-negative and HIV-positive MSM, suggesting that the promotion of HIV risk reduction should also be tailored according to HIV status. For any promotion of risk reduction that aims to bridge this serological divide, a significant challenge is that HIV-negative MSM are not positive about viral load sorting, and HIV-positive men are not as positive about condom use. Tailoring of approaches to promote HIV risk reduction could be based on individuals' risk perceptions. Information, education and communication approaches could focus on the promotion of strategies that are seen as risk-reducing that align with the existing preferences of HIV-negative and HIV-positive MSM, for example promoting condom use when these are viewed positively and focussing on PrEP when condoms are viewed negatively.

A second implication is that the promotion of HIV risk reduction should also emphasize the real-life effectiveness of the various risk reduction strategies. This may have the potential to contribute to more positive attitudes regarding novel biomedical strategies, in particular PrEP and viral load sorting, most notably among HIV-negative MSM. Thirdly, HIV testing is a form of secondary prevention, requiring sexually active MSM to test regularly, in order for it to affect population HIV rates. Novel testing approaches like community-based testing, internet-based self-testing and self-sampling could persuade more MSM to test regularly.

## Conclusion

Our findings highlight the importance of HIV serostatus in effectively promoting HIV risk reduction strategies among MSM in the Netherlands. Findings further suggest that HIV risk reduction promotion addressing perceptions of effectiveness holds much potential to shape preferences for strategies. For instance, HIV-negative MSM might be more appreciative of viral load sorting and the  $U=U$  message if they would be convinced of its proven effectiveness. Importantly, despite low perceived sexual pleasure, using condoms remains the most positively rated HIV risk reduction strategy among HIV-negative MSM. This underscores that condom promotion likely remains an important and viable HIV risk reduction strategy among HIV-negative MSM. Taken together, findings suggest that the effective

promotion of HIV risk reduction requires a tailored approach that takes into account personal preferences, sexual context, and the effectiveness of specific risk reduction strategies.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

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