

# **Comparison of the Influence of Internalized Homonegativity on Sexual Risk Behavior of Men Who Have Sex with Men in Spain and Turkey**

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None.

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**Consent to participate (include appropriate consent statements)**

All participants included in this analysis indicated online, prior to providing their answers, that they understand the nature and purpose of the study and consented to take part.

**Consent for publication (consent statement regarding publishing an individual's data or image)**

Not applicable.

**Availability of data and material (data transparency)**

Data is property of the LSHTM and can be accessed upon reasonable request to [coordinator@emis-project.eu](mailto:coordinator@emis-project.eu).

**Code availability (software application or custom code)**

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**Authors' contributions**

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## **Abstract**

**Objectives:** This study aimed to understand how the association between internalized homonegativity (IH) and sexual risk behavior differed in Spain (N=3,336) and Turkey (N=550).

**Methods:** We employed multigroup structural equation modelling.

**Results:** HIV/PrEP knowledge mediated the relationship between IH and sexual risk behavior among MSM in Spain, but not among men in Turkey. Higher HIV/PrEP knowledge was associated with higher sexual risk behavior among MSM in Spain, while among MSM in Turkey the association was in the opposite direction.

**Conclusions:** The meaning of safe-sex may differ across contexts, and this should be taken into consideration when tailoring HIV prevention programs.

**Keywords:** Internalized homonegativity, sexual risk behavior, HIV knowledge, MSM, structural equation modelling

## **Introduction**

In 2019, sex between men accounted for 38.7% of all new HIV diagnoses in the countries of the European Economic Area (European Centre for Disease Prevention and Control & World Health Organization, 2020). Rates of HIV among men who have sex with men (MSM) are particularly high in Spain and Turkey (Centro Nacional de Epidemiología, 2018; Mirandola et al., 2018; T.C. Sağlık Bakanlığı, 2021).

There are many explanations for behaviors that may increase HIV transmission risk among MSM, of which Meyer's minority stress model (Meyer, 2003) is an often cited explanatory model. The model refers to the "excess stress to which individuals from stigmatized social categories are exposed as a result of their social, often minority, position." A minority stressor relevant to HIV transmission risk that has been expanded upon in Meyer's (2003) model is Internalized Homonegativity (IH). It is defined as negative feelings about one's

homosexuality, as a product of social and political stigma and bias rather than a response which stems from within individuals (Herek, 2004). IH has been found to be associated with reduced mental health and well-being (Newcomb & Mustanski, 2010a), problems with coming out (Costa et al., 2013), and depression and drug use (Moody et al., 2018). Importantly, findings about the associations between IH and well-being, depression, and drug use are factors that are known to be associated with sexual risk behaviors (SRB) and transmission of STIs among MSM. However, inconsistent results point to uncertainties about the extent to which IH influences engagement in SRB (Newcomb & Mustanski, 2010a; Puckett et al., 2017a). While some studies found that higher levels of IH was associated with more frequent SRB (Folch et al., 2009; Newcomb & Mustanski, 2010a; Puckett et al., 2017a; Sietins et al., 2020), other studies did not find evidence for a direct relationship (Dawson et al., 2019; Dudley et al., 2004; Newcomb & Mustanski, 2010a; Puckett et al., 2017a).

The inconsistent evidence regarding the relationship between IH and SRB can be partly explained with the existence of potential mediator variables (Kashubeck-West & Szymanski, 2008). Researchers explain that in general, transmission risk of STIs among MSM is mediated by multiple social and structural factors that influence their sexual practices (Baral et al., 2013). These factors jeopardize prevention efforts by limiting MSM's options for accessing prevention services for HIV and other STIs (Andrinopoulos et al., 2015; Velter et al., 2015). Specifically, higher levels of IH seem to hinder their connection to the gay community (Goldbach et al., 2015; Moody et al., 2018), thus, they may also miss information about HIV prevention and risk reduction programs (Williamson, 2000). Similarly, higher levels of IH was found to be associated with higher prevalence of drug use (Moody et al., 2018; Puckett et al., 2017a; Sewell et al., 2017). In turn, higher prevalence of drug use consumption was associated with a higher prevalence of condomless anal sex or sex with multiple partners in Spain (Fernández-Dávila &

Zaragoza Lorca, 2009; Folch et al., 2006, 2010; González-Baeza et al., 2018) and in other contexts (Choi et al., 2005; Drumright et al., 2006; Kashubeck-West & Szymanski, 2008).

It is also possible that the relationship between IH and SRB differs across different socio-cultural contexts, as sexual minority men's daily experiences and identity development are context-specific. A global study of 109,000 gay and bisexual men recently documented that socio-political and cultural homonegativity varies in its manifestation and intensity, and that both manifest socio-political stigma and actual discriminatory events independently contribute to high levels of IH (Berg et al., 2017). For example, while Spain is among the countries with the least hostility toward sexual minorities and offers social protection laws against sexual identity discrimination, Turkey is among the countries with the greatest hostility, with >90% of the population believing that homosexuality is morally unacceptable (Berg et al., 2013). Although Turkey is among the very few countries worldwide that has never criminalized homosexuality, sex between men – particularly taking the receptive role in anal sex – has been a stigmatized behavior both among MSM and general society, despite being culturally prevalent for centuries. Unsurprisingly, studies show that IH among Turkish MSM was considerably higher than among Spanish MSM (The EMIS Network, 2013, 2019) and previous cross-cultural research regarding IH levels suggests that there are numerous variables impacting stigmatization of sexual behavior between men, such as religious motivation and different minority stressors (Brown et al., 2016).

Further, as mentioned, in both Spain and Turkey, an important mode of HIV transmission is sex between men (30.6% in Turkey and 38% in Spain) (Erdinc et al., 2020). However, compared to MSM in Spain, MSM in Turkey suffer from a lack of health services that are tailored for them (Doran et al., 2021; Schmidt et al., 2013). The European MSM Internet Survey (EMIS-2017), showed that while 12.6% of MSM reported lacking control of safer sex in Spain, this rate was 16.7% in Turkey (The EMIS Network, 2019). Similarly, in the same

study, MSM in Turkey reported less awareness of PrEP, less certainty about their HIV status, and less social support in general when compared to MSM in Spain. Unfortunately, there are only a handful of empirical studies concerning Turkish MSM. Among the few studies is a cross-sectional study including 562 sexual minority men in Portugal and Turkey. It found that Turkish men reported significantly higher IH and identity stigma compared to Portuguese men. These differences, in turn, were associated with Turkish men's reduced probability of sexual identity disclosure to family and friends (Torres & Rodrigues, 2021).

Given the inconsistent evidence regarding the relationship between IH and SRB, the uncertainty of the influence of moderators, the contextual differences between Spain and Turkey, and the limited research on IH in Turkey, further research on IH is important. Documenting the association between IH and SRB and possible mediator variables of this relationship within both Spain and Turkey will help determine varying needs in prevention efforts. Thus, using a multi-group structural equation modelling (MG-SEM), our study aimed to disentangle the possible influence of drug use and knowledge regarding HIV and PrEP on the relation between IH and SRB in national samples of MSM living in Spain and Turkey

## **Sample and Methods**

### ***Study Sample***

We used data from the 2017 wave of the European MSM Internet Survey (EMIS-2017). The detailed methods have been reported elsewhere (Weatherburn et al., 2020). EMIS-2017 was an internet based, self-completion survey conducted in 33-languages for men living in Europe who have sex with men and/or are sexually attracted to other men. No financial incentives were given to participants and no personal identifying information (including IP addresses) were collected. More background information is available at [www.emis2017.eu](http://www.emis2017.eu).

The sub-sample of MSM living in Turkey consisted of 1,855 respondents, with 94.3% using the Turkish language version of the survey, followed by 3.5% using the English version.

Recruitment largely occurred through trans-national dating apps. Hornet accounted for 31% of recruits, PlanetRomeo for 25%, and Grindr, SCRUFF, GROWLr, RECON, Gaydar, and Manhunt/Jack'd collectively for 4%. Recruitment was also through national partners via websites (3%) and social media (3%). For 34% of respondents, the source of recruitment remained unknown.

The sub-sample of MSM living in Spain consisted of 10,652 respondents, with 92.1% using the Spanish (Castilian) version of the survey (no other co-official languages of Spain, such as Catalan/Valencian, Galician, or Basque were offered). Grindr accounted for 48%, PlanetRomeo 19%, and SCRUFF, GROWLr, RECON, Gaydar, Hornet, and Manhunt/Jack'd collectively 11% of recruits living in Spain. MSM were also recruited through national partners via websites (16%) and social media (1%) (Ministerio de Sanidad, 2020).

The IH scale questions were randomly distributed to half of the survey respondents (Spain n=5,310; Turkey n=926), to avoid losing participants because of asking too many questions. We excluded MSM who did not provide answers to all seven items of the scale (Spain n=678; Turkey n=163), MSM who reported having undetectable HIV viral load (Spain n=613; Turkey n=80), and those using PrEP (Spain n=117; Turkey n=11), because condomless anal intercourse among men with undetectable viral load or using PrEP bear no intrinsic HIV risk. Therefore, our final analytical sample consisted of 3,902 MSM in Spain and 672 MSM in Turkey.

### ***Measurements***

*Internalized homonegativity (IH).* To assess IH, we used the 7-item SIHS (Berg et al., 2013; Tran et al., 2018). EMIS-2017 participants answered the items on a 7-point disagree-agree (with does-not-apply) scale. The SIHS items are “Social situations with gay men make me feel uncomfortable”; “Homosexuality is morally acceptable to me”; “Even if I could change my sexual orientation, I wouldn't”; “I feel comfortable in gay bars”; “I feel comfortable being



seen in public with an obviously gay person”; “I feel comfortable being a homosexual man”; “I feel comfortable discussing homosexuality in a public situation.” The validity and reliability of SIHS were confirmed across 38 European countries, with multigroup validation for 7-item scale fit indices showing good fit to data from 38 country groups (CFI=0.982, TLI=0.983, and RMSEA=0.032) (see Tran et al. (2018) for further statistics).

*Sexual Risk Behavior (SRB).* SRB of the respondents was assessed with a single question: “How many non-steady male partners have you had intercourse without a condom with in the last 12 months?” Participants were informed that non-steady partners mean “men you have had sex with once only, and men you have sex with more than once but who you don’t think of as a steady partner (including one-night stands, anonymous and casual partners, regular sex buddies)”. The possible answer options for this question in the survey ranged from 0 to 15; with numbers 0 to 10 equivalent to their values, and numbers 11 to 15 indicating 11–20, 21–30, 31–40, 41–50, and more than 50 partners respondents had condomless intercourse with. We recoded this variable into seven categories: 0; 1; 2–5; 6–10; 11–20; 20–50; and more than 50. Note that our definition of the risk behavior is related to HIV risk and does not relate directly to other STIs.

*HIV/PrEP Knowledge (HPK).* We used two measures to construct the HIV/PrEP knowledge latent variable: HIV knowledge and PrEP knowledge. HIV knowledge was constructed from seven items, assessed with a 5-point knowledge response set, with possible answers including “I do not believe this”, “I wasn’t sure about this”, and “I knew this already”. These items were “AIDS is caused by a virus called HIV”; “If someone becomes infected with HIV it may take several weeks before it can be detected in a test”; “You cannot be confident about whether someone has HIV or not from their appearance”; “There is a medical test that can show whether or not you have HIV”; “There is currently no cure for HIV infection”; “HIV infection can be controlled with medicines so that its impact on health is much less”; “A person

with HIV who is on effective treatment (called ‘undetectable viral load’) cannot pass their virus to someone else during sex.” PrEP knowledge included three items assessed with the same response set: “Pre-Exposure Prophylaxis (PrEP) involves someone who does not have HIV taking pills before as well as after sex to prevent them getting HIV”; “PrEP can be taken as a single daily pill if someone does not know in advance when they will have sex”; “If someone knows in advance when they will have sex, PrEP needs to be taken as a double dose approximately 24 hours before sex and then at both 24 and 48 hours after the double dose.” Each of these 10 items were recoded into a dummy variable, with value 1 indicating “I knew this already,” and value 0 indicating all the other answers. Then, we created an additive scale with these 10 items. With each factual knowledge (I knew this already), respondents scored one point on the additive scale, thus the score ranged from 0 to 10.

*Substance Use (SU).* We used six observed variables for the substance use latent variable, based on how long-ago respondents used substances in any context. The six substances (see table 1) were assessed with an 8-point recency scale, ranging from (1) “never” to (8) “in the past 24 hours” (after inverting the original scale).

*Sex Under the Influence of Substances (SUIS).* The respondents were asked, “In the last 12 months, how much of the sex you’ve had with men has been under the influence of alcohol or any other drug?” The possible answers for this question ranged from (1) “none of it” to (7) “all of it”.

## **Methods**

We use RStudio and the ‘lavaan’ package (Rosseel, 2012) to run our structural equation model. We employed a similar structural model developed in the study of Sönmez et al. (2021). Prior to the analysis, the data was checked for multicollinearity, missing data, departures from normality and distributions. Multicollinearity was not present. Missing data were handled with pairwise deletion and after this step, our sample consisted of 3,694 MSM in Spain and 550

MSM in Turkey. For descriptive purposes, we first estimated the prevalence and means (if applicable) of all variables, by country. Comparisons of variables between each category were conducted using Rao-Scott chi-square. We used a multi-group structural equation modelling (MG-SEM) approach. It is useful if the research sample involves more than one sample and the concern is to determine whether or not the components of the estimations are equivalent across groups (Byrne, 2016).

We applied the two-step approach proposed by Byrne (2016), whereby we first established invariance of the measurement model's groups, and then of the structural model (for a similar example, see Sihombing (2012)). First, we established a baseline model for the samples from Spain and Turkey separately. Measurement invariance of a multiple-group confirmatory factor analysis (MG-CFA) is necessary when a construct is to be tested across groups or points in time, and to determine whether the compared groups are based on instruments that measure the same construct (Chen, 2007). Levels of measurement invariance has implications on the interpretation of differences across groups (Hirschfeld & von Brachel, 2014). Therefore, the goal is to determine and establish the measurement invariance, so that we can have a statistical model in which we can assume that the constructs are interpreted in the same way by the participants across groups (van de Schoot et al., 2012). Briefly, measurement invariance is established by first having a baseline CFA model where the paths are the same across groups, but parameter loadings, intercepts, and residuals are allowed to vary across groups. Then, a series of model comparisons are examined, into which we introduce stricter equality constraints to be able to test the model fit's change. If all the equality constraints and the model fit the data well, then the interpretation of the relationship can be attributed to pure differences across groups. These steps are explained in greater detail elsewhere (Chen, 2007; Hirschfeld & von Brachel, 2014; van de Schoot et al., 2012).

Following the above-mentioned steps, we established the model's fit using confirmatory factor analysis (CFA) for each sample separately, to determine how well the models fit the data across groups when no cross-groups constraints are imposed. Next, we introduced equality constraints on parameters step-by-step and analyzed the data simultaneously. When the multi-group CFA's measurement validity was established, we introduced structural constraints to our multi-group SEM model to determine whether our SEM model's results were attributable to actual differences across groups, instead of differences of coefficients and parameters estimated from covariances derived from different subsets.

We explain these steps in greater detail in the Appendix. At all steps mentioned, we used commonly employed key fit indices, such as (a) the Comparative Fit Index (CFI); (b) the Tucker-Lewis Index (TLI); (c) the root mean square error of approximation (RMSEA), and (d) Standardized root mean squared residual (SRMR) (Hu & Bentler, 1999; Weston & Gore, 2006). Most studies suggest that values higher than .95 for CFI and TLI indicate good fit (Hu & Bentler, 1999; Weston & Gore, 2006), while some suggest that CFI and TLI > .90 indicate a good fit to data (Moonie et al., 2009) as these fits indicates are susceptible to factors such as estimators and complexity (Xia & Yang, 2019). Given the complexity of our MG-SEM, we employ CFI and TLI > .90 as our fit indices criteria. Further, Hu & Bentler (1999) suggested that values of RMSEA and SRMR < .06 are acceptable, and these values are widely accepted (Weston & Gore, 2006).

## **Results**

### ***Descriptive Statistics***

Table 1 presents the descriptive results for the variables. The estimated prevalence for all variables differed by country ( $p < 0.001$ , except for SUIIS ( $P = 0.001$ ) and use of GHB/GBL ( $P = 0.005$ )). Out of 3,694 MSM in Spain, 59.7% ( $n = 2,205$ ) reported no non-steady partners that they had condomless sex with, while 0.5% ( $n = 17$ ) reported more than 50 partners in the

previous twelve months. In Turkey, about half of the 616 MSM reported no non-steady partners that they had condomless sex with, while only two respondents reported having more than 50 partners in the previous twelve months. MSM in Turkey had higher IH score overall (2.4 vs. 1.3 in Spain). In the HPK additive scale, MSM in Spain had an overall score of 7.14, while MSM in Turkey scored 6.0. Almost half of respondents in both Spain and Turkey (46.2%, n=1,717; 42.7%, n=261, respectively) reported no SUIIS in the previous twelve months, while a small portion reported all of it (1.5%, n=57; 1.1%, n=7, respectively).

[Table 1 about here]

### ***Confirmatory Factor Analysis***

The CFA model for each country showed a good fit to the data separately: Spain, CFI=0.97, TLI=0.96, RMSEA=0.03; Turkey, CFI=0.95, TLI =0.94; RMSEA=0.04. We established the measurement invariance for the multi-group CFA step-by-step (see Appendix) and also the final CFA model showed a good fit to data (CFI=0.95, RMSEA=0.04).

### ***Structural Equation Modelling: Model Fit***

Before establishing SEM's fit to the data, we introduced constraints on the intercepts and paths of the model and compared the results to the free model (see Appendix). The comparison did not show statistical significance ( $p=0.30$ ), which allowed us to conclude that the constrained model was equivalent to the free model. The final multi-group SEM model (see Appendix, Table 2, row3) showed good fit to data (CFI=0.97, TLI=0.96, RMSEA=0.039 (90%-CI: 0.039–0.042)).

### ***Structural Equation Modelling: Estimations***

We provide standardized estimates of coefficients and errors for both groups. The results are presented in Figure 1 and Table 2. The direct path from IH to SRB (dashed line, Figure 1) did not reach statistical significance for either sample.

For both samples of MSM from Spain and Turkey, IH was negatively associated with HIV/PrEP knowledge. Each standard deviation (SD) increase in the IH latent variable was significantly associated with 0.226 and 0.263 decrease in the HIV/PrEP knowledge units, respectively. The relationship between HIV/PrEP knowledge and SRB, however, was different across the two samples. For MSM in Spain, each SD increase in the HIV/PrEP knowledge was significantly associated with 0.063 increase in the SRB units. While for MSM in Turkey, each SD increase in HIV/PrEP knowledge was significantly associated with 0.084 decrease in the SRB units. The effect of IH on HIV/PrEP knowledge was slightly larger in the Turkey sample. Similarly, as shown in Table 2, the indirect relationship between IH and SRB through HIV/PrEP knowledge varied across groups. For MSM in Spain, we found that an increase of 0.226 SD in the IH latent variable was associated with 0.01 decrease SRB units, when mediated by the HIV/PrEP knowledge. In contrast, the indirect relationship between IH and SRB through HIV/PrEP knowledge was statistically non-significant in the Turkey sample.

[Figure 1 about here]

In both samples, with respect to the relationship among IH, SUIS and SRB, we found that the relationship between IH and SUIS was non-significant, while the association between the SUIS latent variable and SRB was positive and significant. Expectedly, Figure 1 shows that a standard deviation increase in SUIS was significantly associated with a 0.275 and 0.282 increase in the SRB units, in the Spain and Turkey samples, respectively. The indirect path

between IH and SRB mediated by SUIS was statistically non-significant for both groups (Table 3).

Figure 1 shows that as IH decreased, the recency of substance use and the coefficient were considerably larger in the Turkey sample than in the Spain sample. Each SD increase in the IH latent variable was significantly associated with 0.085 and 0.211 decrease in the substance use units, for the Spain and Turkey samples, respectively. Further, recency of substance use predicted SUIS significantly and positively in both samples. There was also a statistically significant indirect path from IH to SUIS when mediated by substance use recency. As IH increased (0.646 and 0.761 SD), SUIS decreased (0.055 and 0.160 units for the Spain and Turkey samples, respectively); because higher IH predicted less recent use of substances and more recent use of substances predicted higher frequency of SUIS for both groups.

[Table 2 about here]

## **Discussion**

In this study, we examined the relationship between IH and SRB, and possible mediators of this relationship across samples of MSM in Spain and Turkey. Among MSM in both countries, we found no direct relationship between IH and SRB, which is consistent with previous research (Dawson et al., 2019; Newcomb & Mustanski, 2010b; Puckett et al., 2017b) and suggestive of there being potential mediators on this relationship (Kashubeck-West & Szymanski, 2008; Newcomb & Mustanski, 2010b). While HIV/PrEP knowledge mediated the relationship between IH and SRB for Spain, we did not find evidence of mediation for Turkey. For both countries, SUIS was not a significant mediator of the relationship between IH and SRB, but substance use significantly mediated the relationship between IH and SUIS.

We found that, for both countries, higher IH was associated with reduced HIV/PrEP knowledge. That is, MSM with higher IH were less likely to be knowledgeable about HIV and

PrEP. This finding is consistent with previous studies documenting that IH can reduce awareness of information related to MSM's sexual health. Lower IH has been found to be a predictor of greater sexual identity certainty among gay men (Morandini et al., 2015), and because IH can hinder gay men's connection to and involvement in the gay community (Goldbach et al., 2015; Moody et al., 2018), it may limit their exposure to HIV/PrEP knowledge. Gay communities and venues are where the targeted information is available for gay and bisexual men (Williamson, 2000). It is also worth noting that generational differences can influence gay men's ambivalence of what 'gay community' mean due to the changing status of homosexuality and the HIV epidemic (Holt, 2011). Future studies should consider variables related to community connectedness when examining the relationship between IH and HIV/PrEP knowledge.

An important finding of this study is that while increased HIV/PrEP knowledge was associated with increased number of condomless sexual intercourse with non-steady partners for MSM in Spain, it reduced the number of condomless sexual intercourse with non-steady partners for MSM in Turkey. One explanation for this inconsistent result could be that MSM in Spain, who have much lower IH than MSM in Turkey, are also more likely to be a part of a gay community and therefore have an increased chance of acquiring more knowledge about HIV/AIDS related information and about protecting themselves.

In the sample of MSM in Turkey, HIV/PrEP knowledge did not mediate IH and SRB. For MSM in Spain, however, we found that as IH increased, the number of condomless intercourse with non-steady partners reported – that is, SRB – decreased; because higher IH was associated with reduced HIV/PrEP knowledge while higher HIV/PrEP knowledge was associated with increased SRB. Therefore, we found that, when mediated with HIV/PrEP knowledge, there was a positive association between IH and SRB among MSM in Spain. On one hand, this finding may be because men with higher IH tend to have reduced self-efficacy



for condom use (Huebner et al., 2002) and those who are less knowledgeable about self-prevention strategies may not be confident enough, given their high IH, to communicate safer sex practices with non-steady partners. On the other hand, it is likely that those men who are able to negotiate sexual safeness (e.g., knowing that no HIV transmissions from the HIV-positive partner to the HIV-negative partner would occur if their viral load is undetectable [“U=U”], e.g., communicating about how long ago they have been tested or whether their non-steady partner is using PrEP are more knowledgeable about specific compartments of the HIV/PrEP knowledge scale than those who cannot). For example, the EMIS-2017 documented that while 63.6% of MSM in Spain were aware of PrEP, this rate was only 29.1% for MSM in Turkey (The EMIS Network, 2019). Similarly, in Spain, 54.5% of MSM had awareness of U=U while this rate was 37.6% in Turkey. Thus, it is possible that MSM in Spain are more likely than MSM in Turkey to protect themselves although they have more condomless sex.

For MSM in both countries, we found that sex under the influence of substances (SUIS) predicted SRB, without IH influencing SUIS. This finding corroborates previous evidence. For example, a study among the attendees of a clinic in Amsterdam reported that among HIV-negative MSM, sex-related drug use was associated with sexually transmitted infections (chlamydia, gonorrhea, or syphilis) even after adjusting for high-risk sexual behavior (Heiligenberg et al., 2012). Another study showed that MSM in the UK who reported drug use were more likely to have condomless anal sex with a casual partner in the past year (Sewell et al., 2017). Similarly, we found that substance use recency mediated the relationship between IH and SUIS. As IH increased, SUIS decreased; because higher IH predicted less recent use of substances and more recent use of substances predicted more frequent SUIS. This suggests that higher IH levels can protect MSM from the risk of SUIS and SRB, indirectly. It is possible that this result emerged because MSM with higher IH in our sample perhaps are less likely to be involved in anal intercourse with non-steady partners in the first place. Alternatively, it is

possible these MSM are less likely to attend gay or queer specific venues, where substance use is frequent, as some studies suggest that community attachment for gay men is directly linked with substance use (Carpiano et al., 2011; Moody et al., 2018).

### *Strengths and Limitations*

Our study has several methodological strengths, including being one of the largest datasets of MSM living in Turkey and use of SEM. We used recency time formats (when did you last...) for substance use variables, which reduces the chance of recall bias. Unlike frequency formats, recency format is intuitive for most people. Similarly, there is no recall bias in questions about knowledge and the proportion of sex under the influence of substances. While accurately reporting number of partners is generally a challenge, we do not believe this affects our conclusions. Another strength of this study lies in its anonymous character, through which the risk of social desirability bias is reduced (as opposed to the interview setting).

We also acknowledge that the study has limitations. While we used a large, diverse sample of MSM, the data come from a non-probability sample, potentially limiting generalizability, especially to those who are older, have lower education, fewer LGBT community attachments, or are more likely to conceal their sexual orientation (Prah et al., 2016). Yet, our analyses assume that the distribution of variables in the EMIS-2017 sample matches the distribution of these variables in the population. Further, non-probability sampling can also lead to higher estimates of sexual risk, drug use, or knowledge among MSM. These concerns are somewhat attenuated given that the present study was not focused on establishing population estimates of risk behaviors, HIV/PrEP knowledge, or IH, but instead sought to examine associations among variables, for which non-probability sampling is more appropriate (Meyer & Wilson, 2009). Further, probability-based studies typically include relatively small

numbers of sexual minorities in one country only, and thus would not have provided an adequate sample size across numerous countries with which to evaluate our research aims.

## **Conclusion**

To our knowledge, this is the first study to examine the impact of internalized homonegativity on sexual risk behavior of MSM in Turkey. Our SEM results suggest that IH is not directly implicated in the path to SRB. We also found that HIV/PrEP knowledge mediated the relationship between IH and SRB for MSM in Spain, but not MSM in Turkey. Future studies and HIV prevention programs should consider focusing on communicating what actually makes one less vulnerable to HIV, which is the knowledge that goes into the ability to negotiate sexual safety, especially in the context of Turkey. Likewise, attention should be paid to diverse ways one can enjoy sexual pleasure (Ford et al., 2021) and how it might be effected by cross-cultural differences between understanding of IH and sexual risk behavior. Similarly, for MSM in Spain, future prevention strategies should also target specific counselling for MSM with low IH and who are relatively knowledgeable about HIV risks and how PrEP works, in order to ensure that they are included within the prevention messages. Lastly, in both contexts, it is important that future interventions consider addressing substance use in general and sex under the influence of substances, for this population.

## **Appendix**

### ***Measurement Invariance and Multi-group Confirmatory Factor Analysis***

Following Hirschfeld & von Brachel (2014) to test measurement invariance of a MG-CFA, the first step was to run a confirmatory factor analysis (CFA) for each group separately and the validity of CFA for each group is established (Spain, CFI=0.97, TLI=0.96, RMSEA=0.03; Turkey, CFI=0.95; TLI=0.94; RMSEA=0.04). Then, we ran a multigroup CFA

with no equality constraints, in other words Configural invariance, (Table 1, Model 1 (M1)) and this model also had a good fit (CFI=0.97; TLI=0.96; RMSEA=0.03).

Then, we ran a model where we only constrained the factor loadings to be equal across groups (Table 1, Model 2 (M2)). This is called metric invariance test and it determines whether the respondents of different groups attribute the same meaning to the latent constructs (van de Schoot et al., 2012). When compared to M1, M2 had lower CFI and RMSEA ( $\Delta$ CFI=0.004,  $\Delta$ RMSEA=0.002), but M2 still had a good fit (CFI=0.96, RMSEA=0.04). Our CFA model showed metric invariance across groups.

Next, we ran a model where both the factor loadings and intercepts were constrained to be equal across groups (Table 1, Model 3 (M3)). In addition to the meaning of latent constructs, the levels of the underlying manifest variables (intercepts) were held equal in both groups, allowing us to measure scale invariance. When compared to M2, M3 had a lower CFI and RMSEA ( $\Delta$ CFI=0.009,  $\Delta$ RMSEA=0.004), but M3 still had a good fit (CFI=0.90, RMSEA=0.04), which gave evidence for our model's scalar invariance.

Finally, we tested the residual invariance of our model, by adding the additional constraint of equal residual variances for the observed variables across the groups (Table 1, Model 4 (M4)). In other words, this final step determines whether the latent construct is measured *identically* across groups (van de Schoot et al., 2012). When compared to M3, M4 had lower CFI and RMSEA, which suggested a poor fit to data. Thus, we rejected M4, as M3 comparatively showed a better fit and residual invariance could not be established.

In the given situation, the next step was to determine partial residual invariance (Hirschfeld & von Brachel, 2014) and identify which individual parameters should be set free so that residual invariance could be established. We step-by-step freed and constrained several individual parameters of M4 based on the modification indices. The results showed that particular observed variables' parameters should be set free in our model. These were: IH5 "I

*feel comfortable being a homosexual man;*” IH6 “*Homosexuality is morally acceptable to me;*” IH7 “*Even if I could change my sexual orientation, I wouldn't*” as shown in Table 1, Model 4a (M4a). In other words, we needed to set these observed variables to be estimated differently across the two samples, so that we could establish residual invariance across groups and therefore, attribute the CFA model's results to the differences across groups. M4a showed good fit on its own (CFI=0.94, RMSEA=0.05) and when compared to the M3 ( $\Delta$ CFI=0.017,  $\Delta$ RMSEA=0.007). In conclusion, measurement invariance of our MG-CFA is established.

[Table 1 about here]

### ***Structural Equation Modelling: Model Fit and Structural Constraints***

#### ***Model Fit***

The fit indices for the SEM models are shown in Table 2. The SEM output for these fit indices suggested that the hypothesized model for Spain (CFI=0.97, TLI=0.96, RMSEA=0.038 (90% CI: 0.035-0.041)), for Turkey (CFI=0.95, TLI=0.94, RMSEA=0.042 (90% CI: 0.033-0.051)), and for the multigroup model (CFI=0.97, TLI=0.96, RMSEA=0.039 (90% CI: 0.039-0.042)) were a good fit to data.

[Table 2 about here]

The last step in determining whether our SEM model's results were attributable to actual differences across groups, instead of differences of coefficients and parameters estimated from covariances derived from different subsets. Row 4 in Table 2 shows the comparison results of the free multigroup model versus constrained (paths and intercepts) multigroup model. The result (P-value = 0.30) allowed us to conclude that the constrained model was equivalent to the

free model. In other words, the coefficients did not vary by group and comparisons across groups could be interpreted validly within a multigroup model.

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