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ORIGINAL PAPER

Does the Theory of Planned Behaviour Explain Condom Use Behaviour Among Men Who have Sex with Men? A Meta-analytic Review of the Literature

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Abstract The aim of this meta-analysis was to explore whether the constructs in the theory of planned behaviour (TPB; i.e., attitude, subjective norm, perceived behavioural control, intention) explain condom use behaviour among men who have sex with men (MSM). Electronic databases were searched for studies that measured TPB variables and MSM condom use. Correlations were meta-analysed using a random effects model and path analyses. Moderation analyses were conducted for the time frame of the behavioural measure used (retrospective versus prospective). Attitude, subjective norm and perceived behavioural control accounted for 24.0 % of the variance in condom use intention and were all significant correlates. Intention and PBC accounted for 12.4 % of the variance in condom use behaviour. However, after taking intention into account, PBC was no longer significantly associated with condom use. The strength of construct relationships did not differ between retrospective and prospective behavioural assessments. The medium to large effect sizes of the relationships between the constructs in the TPB, which are consistent with previous meta-analyses with different behaviours or target groups, suggest that the TPB is also a useful model for explaining condom use behaviour among MSM. However, the research in this area is rather small, and greater clarity over moderating factors can only be achieved when the literature expands.

Keywords Theory of planned behaviour · Condom · Meta-analysis · MSM

Introduction

In most developed countries HIV continues to be primarily transmitted through sexual contact between men [1, 2]. Studies in North America, Western Europe, and Australia have found that men who have sex with men (MSM) continue to be disproportionately affected by HIV [1–4]. HIV diagnoses among MSM have increased in most Western countries since 2000, and recent data indicate stable or increasing trends in HIV infection among MSM in these areas [3, 5, 6]. United States estimates in 2010 found that MSM comprised 63 % of the total number of HIV diagnoses and 78 % of new infections among males, despite only comprising 4 % of the male population [1]. Over the period 2007–2011 HIV incidence among MSM indicated sustained epidemic patterns worldwide where data was available with no evidence of decline [7].

In the past two decades HIV prevention has diversified to include medication-based methods. Methods include post-exposure prophylaxis (PEP) and pre-exposure prophylaxis (PreP), which offer methods other than (or as an adjunct to) condom use with which to protect oneself from HIV. Treatment as prevention (TasP), the early initiation of antiretroviral therapies by those infected to reduce viral load to undetectable levels for the combined purposes of

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improving people's health and reducing the likelihood of onward transmission, is also recommended [8, 9]. The introduction of such methods has meant that a variety of HIV prevention strategies in addition to condom use are becoming increasingly known and offered to MSM, and likely influence population-level dynamics in regard to condom use behaviour as they are introduced, and possibly come at the cost of consistent condom use [8].

Despite significant community and public sector condom use promotion and increases in the availability of condoms, studies commonly report inconsistent condom use e.g., [10–13] and decreases in condom use over time among MSM e.g., [14–16]. Strengthening consistent condom use would aid in curbing HIV infection rates among MSM and the need for effective interventions that promote condom use remains strong. To develop effective interventions aimed at increasing condom use, it is critical to understand the factors related to condom use. Theory-informed studies that identify the factors potential involved in condom use in a particular population group provide critical information about the processes important to behavioural change and may guide the development of interventions that address relevant variables [8]. Meta-analytic evidence has indicated that interventions that aim to reduce sexual risk behaviour (e.g., reduce number of sexual partners, decrease unprotected anal intercourse, and increase condom use during anal intercourse) among MSM are more successful when based on a theoretical model than when a theoretical model is absent [17].

Evidence regarding how well theoretical models explain a particular behaviour in a specific population group is pivotal to informed decisions regarding the choice of a theory to guide intervention development. The Theory of Planned Behaviour (TPB; 19) is one of the most extensively used theories to explore social and health behaviours and those interventions based on it, albeit few, have reported some success in improving health behaviours such as condom use [18, 19]. Despite criticisms of the TPB, such as its limited predictive validity [20], the TPB has accounted for relatively high levels of variance in health behaviour, and frequently more than other models [21–24]. The TPB proposes that it is a person's intention to perform a behaviour that is the best predictor of behaviour. The TPB suggests that there are three immediate determinants of intention, notably, an individual's *attitude* regarding the behaviour in question (i.e., the degree to which a behaviour is evaluated positively or negatively), their *subjective norm* (SN) regarding the behaviour (i.e., the perceived support from significant others to perform the behaviour), and their *perceived behavioural control* (PBC) over the behaviour (i.e., the perceived ease or difficulty of performing the behaviour). PBC is also proposed to contribute its own unique variance to behaviour as it may be used as a proxy for actual behavioural control. The TPB assumes that all other variables that may be proposed to exert influence over intention and behaviour (e.g., demographics) do so via attitude, SN, and PBC.

In assessing the TPB's utility in explaining health behaviours, a recent meta-analytic review of 237 studies that included prospective behavioural measures found that the model accounted for 19.3 % of the variance in a range of health behaviours with intention being the strongest correlate of behaviour [25]. The meta-analysis also found that the explanatory utility of the TPB was stronger the more temporarily proximal the behavioural measures were to those of attitude, SN, PBC, and intention. Of the datasets included in the review, 16 involved preparatory condom behaviours and/or condom use. Of these 16 data sets only two were obtained from MSM samples [26, 27]. In specifically determining the TPB's ability to explain condom use behaviour, Albarracin, Johnson, Fishbein, and Muellerleile [28] synthesised 96 data sets containing data regarding relationships between the key Theory of Reasoned Action (TRA, the TPB's predecessor, [29]) and TPB variables, with condom use behaviour. Their findings indicated significant relationships between all variables in the TRA and the TPB, with the exception of the PBC-behaviour relationship. While PBC was significantly associated with condom use, it did not make a significant contribution after controlling for intention. Albarracin et al. further noted that the intention-behaviour and PBC-behaviour associations were stronger for retrospective assessments of behaviour than for prospective assessments. They inferred this result may suggest that while, as the theory proposes, intentions may influence behaviour prospectively, retrospective inferences regarding past behaviour may also guide intentions. Past behaviour has also been found to explain future behaviour over and above intention [30]. Many authors suggest that past behaviour may, at least in part, contribute directly to future behaviour and that it may do so through the formation of habits [31–34]. Many studies, in particular those that are cross-sectional, often only measure behavioural intentions, under the assumption that they are a good proxy for actual behaviour [35]. However, meta-analyses of condom use find only partial support for this assumption, reporting correlations between 0.44 and 0.46 for this relationship [28, 36]. It is therefore of note that many cross-sectional studies use retrospective assessment as their behavioural outcome, which may confound and inflate the strength of the intention-behaviour relationship. Therefore, more rigorous tests of the TPB should involve the use of prospective behavioural measures, and experimental designs would provide the strongest test.

It is important to note that of the 96 datasets included in the Albarracin et al. [28] review only one [37], which did

not pertain to MSM, was published later than June 1996, the year in which effective antiretroviral therapies (ART) became widely available. While previously HIV was typically a terminal disease, the introduction of ART has meant that HIV has become a chronic disease and life expectancy of people with HIV has increased significantly [38], approaching that of people without HIV. Furthermore, the datasets were obtained from a wide variety of population groups, with few studies pertaining to MSM. Additionally, it is also of note that none of the studies in the meta-analysis of behavioural interventions undertaken by Herbst and colleagues specifically aimed at reducing sexual risk behaviour among MSM utilised the entire TPB as a theoretical model [17].

The increasing availability of ART-based HIV prevention methods has effectively altered the course and nature of HIV, and likely influence beliefs and practices regarding HIV prevention and interventions, particularly among MSM, a key population at risk of HIV infection [8, 39–41]. The research examining decreases in condom use in the context of the implementation of biomedical approaches to HIV prevention and any influence on HIV infection rates is in its infancy [8]. Current research largely confirms that observed decreases in condom use [15, 16, 42] have likely resulted in increased and ongoing HIV infections among MSM, and that behavioural interventions such as condom use remain an essential component of HIV intervention among MSM [8]. Despite this there are no reviews of theory-based studies of condom use among MSM. Given the previous meta-analytic evidence suggesting that the TPB is the most appropriate model for assessing the processes involved in condom use [28], the time since the last meta-analytic review, and the absence of a review specific to MSM, a review of the literature as it applies to the TPB is warranted.

Thus, the aim of the present meta-analysis was to:

(a) Establish the relationships between the variables in the TPB, using data from studies that have assessed condom use behaviour among MSM populations specifically. That is, the relationship between intention and the constructs that are purported to determine it (i.e., attitude towards condom use, SN, and PBC), the relationship between PBC and behaviour, and between intention and behaviour. As past studies and reviews have found empirical support for the TPB as a model of health behaviour it is hypothesised that attitudes toward condom use, SN and PBC will be significantly associated with intention, and that both PBC and intention will be significantly associated with condom use.
(b) Establish any moderating effects of the type of behavioural measure used on the intention-behaviour relationship. That is, whether using a measure of intention with a retrospective behavioural measure versus a prospective behavioural measure, influences the strength of the intention-behaviour relationship. As intentions are usually in accordance with past behaviour, it is hypothesised that the intention-behaviour relationship will be moderated by the type of behavioural measure used, such that the association with retrospective behaviour will be stronger than with prospective behaviour.

Method

Search Strategy

A systematic literature search was conducted in September 2014 using the electronic databases PsychInfo, Medline, CINAHL, and Web of Science. The current search strategy used the following keywords: [Theory of Planned Behavio* OR Theory of Reasoned Action OR Reasoned Action Approach OR TPB OR intentions OR Fishbein OR Ajzen OR Reasoned Action OR Planned Behavior] AND [sex* OR intercourse* OR *sexual intercourse (human)* OR same sex intercourse OR contraceptive devices OR condom* OR contracepti*]. For an example of the search strategy, please see Supplementary file 1. The search was restricted to peer- reviewed journal articles and English language papers.

Thorough searches of the World Health Organisation database, key journals (e.g., AIDS and Behavior), and the reference list of the Albarracin et al. [28] meta-analysis were conducted. The purpose was to ensure that no relevant papers were overlooked in the electronic database search. No additional papers were identified. Conference abstracts were excluded as they contained insufficient information to conduct the required analyses, and as there might have been overlap with journal publications. The search, analysis, and manuscript preparation were informed by PRISMA [43] and Cochrane guidelines [44], and a copy of the PRISMA checklist is available in Supplementary file 2. A coding manual was utilised, developed collaboratively and iteratively by the authors and was pilot tested on a small sample of articles. A copy of the coding manual is available upon request from the authors.

Inclusion/Exclusion Criteria

Studies were eligible for inclusion if they provided a measure of all the variables that the TRA/TPB propose determine intention (attitude, SN, and PBC), a measure of intention, a

measure of condom use behaviour, were conducted in MSM populations, and contained sufficient statistical information regarding all construct relationships specified by the TPB (i.e., correlations or odds ratios) either in the paper or upon request from the authors. As in the Albarracin et al. [28] review, a study was considered to measure PBC if it measured the extent to which participants felt that they would use condoms if they wanted to, that condom use was their decision, and/or whether using condoms was easy or difficult. Both cross-sectional and prospective studies were eligible for inclusion when all other inclusion criteria were met. Intervention studies were considered eligible for inclusion if the TPB measures (including behaviour) were provided prior to application of the intervention. There is debate in the literature regarding the inclusion or exclusion of grey literature [45, 46]. Exclusion of grey literature can potentially increase publication bias as studies that have significant results are more likely to be published [47, 48]. However, grey literature has not been peer-reviewed and is therefore of undetermined quality. Further, there is no clear way to systematically identify grey literature, as dissertation theses are not all consistently indexed in electronic databases, and therefore it is likely that much of the grey literature would still be missed [49]. Therefore, in the present meta-analysis, grey literature was excluded.

Reasons for exclusion of papers were: not using the TRA/TPB, not providing a behavioural measure (e.g., measuring intention and not behaviour), not having been peer-reviewed (including book chapters and dissertations), the author being unable to provide additional data or not responding to requests for additional data, measuring "contraception" behaviour in general rather than condom use in particular, not measuring or defining constructs according to theoretical specifications, not being published in English, reporting a qualitative study, duplicating data, being an addendum or emendation, assessing use of the female condom, being a proposed study, or being a review.

Study Selection

Following the selection of studies based on a title and abstract search by one author, a selection of 10 % of titles and 10 % of abstracts were screened by a second author. There was a high level of agreement between the researchers on combined title and abstract screening (85 %). Disagreements between the researchers were resolved through discussion between authors.

After the title and abstract screening, the researcher responsible for the title and abstract search screened the full text of the selected papers and assessed if they met all the inclusion criteria. A third author screened the full text of a random selection of more than 10 % of the included papers. The level of agreement was 100 %. A relatively high number of false positives were noted given the search keywords. We expect that the most likely explanation for this is the inclusion of the search term "intentions", as it is a term that is included in many studies of health behaviours. However, a broader search was used in order to reduce the likelihood that articles meeting the inclusion criteria were missed. The study selection process resulted in the inclusion of eight articles shown in Fig. 1.

Data Extraction

The following characteristics of the included studies were documented: location (categorical), type of sexual behaviour (categorical, e.g., anal sex, unprotected anal and oral sex combined), partner status (categorical, e.g., casual, regular), mean age of sample (continuous), other sample characteristics (categorical, e.g., HIV status, ethnicity) and whether the behavioural measure was retrospective or prospective (categorical). The complete data-extraction table is attached as Supplementary file 3.

Data Analysis

Correlations were the most frequently reported measure of TPB variable relationships, being reported in seven of the included articles. One study [50] provided odds ratios, and for these data we used Comprehensive Meta-Analysis (CMA) software [51] to convert the odds ratios into correlations. Therefore, Pearson's product-moment correlation coefficient (r) was used as an estimate of effect size for the meta-analysis. Authors who did not report correlations in their studies were contacted by the researchers.

When necessary, negative correlations were reversed so that the direction of the correlations was consistent across studies, for example, when a study measured condom non-use rather than condom use. The attitude-intention, SN-intention, PBC-intention, intention-behaviour, and PBC-behaviour correlations were then analysed. A moderator analysis was conducted to compare correlations, to establish whether the type of behavioural measure used (cross sectional or retrospective) altered the intention-behaviour relationship.

Finally, meta-analytic path analysis was conducted in Analysis of Moment Structures (AMOS) 22.0 software [52] using the pooled correlation matrix in order to provide an overall estimate of the variance in behaviour accounted for by TPB variables. Other meta-analyses have used a similar approach [53, 54].

Meta-analysis

The meta-analysis was conducted with the program CMA [51], using a random effects model based on the method described by Hedges and colleagues [55, 56]. Random

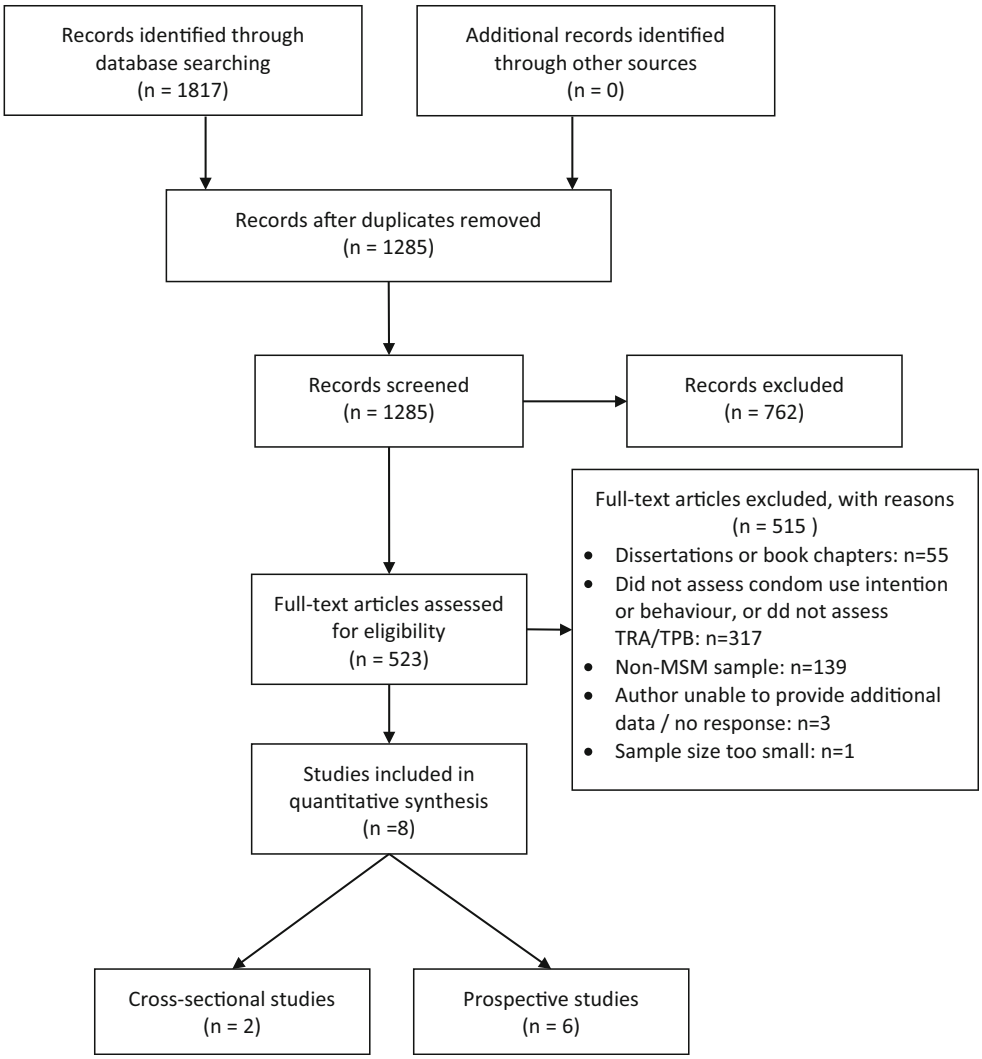

Fig. 1 Study selection process

effects modelling assumes that there are other factors influencing results that have not been accounted for [55, 57]. Random effects models are considered more appropriate when aiming to draw general conclusions from the research [58], as fixed effects models can lead to inflated effect sizes and overly narrow confidence interval estimations [59]. As no studies reported multiple related samples, there was no need to control for dependence.

The effect size reported in this meta-analysis was the average correlation across studies, weighted by the observed sample size ($r+$). Cohen's [60] guidelines were used to interpret the effect size of sample-weighted correlations: $r+ = 0.10$ was considered a small effect size, $r+ = 0.30$ was considered a medium effect size, and $r+ = 0.50$ was considered a large effect size. Fisher's r-to-z transformation for correlations [61] was used to stabilise variance and provide less biased estimates of the average effect size [62]. CMA back translated the Fisher's z scores to r scores for reporting. For every effect size a 95 % confidence interval (CI) was calculated, and Q and I^2 statistics were used to explore heterogeneity. The Q statistic reflects the presence of heterogeneity and when statistically significant, has been used to indicate heterogeneity [63]. However, Q has low power as a comprehensive test of heterogeneity, particularly when there is a small number of studies [64], and I^2 might be considered a more accurate estimate of the degree of heterogeneity in these instances [64, 65]. The I^2 statistic describes the percentage of total variation across the included studies that is a consequence of heterogeneity, rather than chance. An I^2 statistic of up to 25 % indicates low heterogeneity; up to 50 % indicates moderate heterogeneity and 75 % and higher indicates high heterogeneity [65]. Unfortunately, upon completing these analyses, the substantial heterogeneity observed in each estimated relationship meant that formal statistical testing of publication bias could not be performed [66, 67]. The

moderator analysis was conducted in a mixed-effects model. This model generates information about the extent to which moderators influence the true effect sizes.

For path analysis, the harmonic mean N was used to specify the sample size. The percentage variance explained (R^2) was reported; the relative contribution of each variable to the final equation was reported by way of beta weights (β). Fit statistics were not calculated as paths were standardised.

Results

Study Selection

Figure 1 shows the study selection process. The full text of a total of 523 manuscripts was searched. If a manuscript appeared eligible for inclusion but was missing data or the suitability for inclusion needed clarifying, the authors were contacted. Eight authors in total were contacted, seven of whom responded and of these four were able to provide sufficient data for inclusion. Two authors confirmed that their study met exclusion criteria, and one reported that the data was not able to be located. The result of the search and screening was eight articles that met inclusion criteria with sufficient data available.

One study [27] reported analyses regarding two behaviours (i.e. sex with casual and regular partners separately) in the same sample and the datasets were combined to calculate a weighted average correlation; the smallest n was used. One study [68] included both male and female (comprising 48.7 % of the sample) participants. In this instance only the data relevant to MSM was extracted for analysis. One more study met the inclusion criteria but did not report correlations. While this data was requested from the authors, it was not possible to obtain it. The mean sample size of the included datasets was 144.

Across studies, attitude, SN, and PBC were each significantly associated with intention to use condoms; intention and PBC were significantly associated with condom use. The effect sizes of relationships between constructs across studies varied from $r+ = 0.27$ to $r+ = 0.52$. The construct most strongly associated with intention was PBC ($r+ = 0.52$, $p < 0.001$; CI = 0.38–0.64), followed by attitude ($r+ = 0.43$, $p < 0.001$; CI = 0.26–0.57) and SN ($r+ = 0.34$, $p < 0.001$; CI = 0.19–0.48). Intention was also significantly associated with behaviour ($r+ = 0.38$, $p < 0.001$; CI = 0.24–0.49) as was PBC ($r+ = 0.27$, $p < 0.001$; CI = 0.11–0.41).

The heterogeneity of relationships between constructs as assessed in this meta-analysis was moderate to high: attitude-intention ($I^2 = 85.47$ %), SN-intention ($I^2 = 80.34$ %), PBC-intention ($I^2 = 82.23$ %), PBC-behaviour ($I^2 = 69.66$ %), and intention-behaviour ($I^2 = 60.58$ %). An overview of the effect sizes of the relationships between TPB variables is shown in Table 1.

Moderation by Time of Behavioural Assessment

Of the eight datasets two used retrospective condom use behavioural measures [27, 68] and six used prospective measures of condom use [50, 69–72]. The intention-behaviour relationship for condom use among MSM was not significantly moderated by the timeframe of behavioural measure used ($Q = 0.27$, $p = 0.28$). The moderation analyses can be seen in Table 2.

Meta-analytic Path Analysis

Together, attitude, SN and PBC accounted for 24.0 % of the variance in intention. Attitude ($\beta = 0.201$, $p = 0.018$), SN ($\beta = 0.259$, $p = 0.002$), and PBC ($\beta = 0.364$, $p < 0.001$) were all significantly correlated with intention. Intention and PBC accounted for 12.4 % of the variance in behaviour. Intention ($\beta = 0.303$, $p = 0.002$) was a stronger correlate of behaviour than PBC ($\beta = 0.100$, $p = 0.310$). These relationships are shown in Fig. 2.

Discussion

The purpose of this meta-analysis was to assess the relationships between the TPB constructs and condom use among MSM. As posited by the theory, attitude, SN, and PBC were significantly associated with intention and intention and PBC were significantly associated with condom use. Meta-analytic path analysis revealed associations similar to those reported by Albarracin et al. [28]: that attitude, SN, and PBC accounted for a significant proportion of the variance in intention, and were all significant correlates of intention. Similar to the findings of Albarracin et al., while PBC was significantly correlated with behaviour as the TPB suggests, in contrast to the propositions of the theory it was no longer significantly associated with behaviour once intention was accounted for. It was also assessed whether the intention-behaviour relationships differed between retrospective and prospective behavioural assessment. We in particular tested the expectation, based on research suggesting that individuals' intentions are in accordance with their past behaviour [34], that the relationships between intention and behaviour would be stronger in studies using retrospective rather than prospective assessments of condom use. Moderation analysis however showed no difference between retrospective and prospective studies in the strength of the intention-behaviour relationship.

Table 1 Effect sizes of the relationships between TPB variables

	k	r+ (95 % CI)	*p* value	I^2	Q
Attitude-intention	7	0.426 (0.255–0.570)	<0.0001	85.47	41.30
SN-intention	7	0.344 (0.189–0.482)	<0.0001	80.34	30.52
PBC-intention	6	0.523 (0.380–0.641)	<0.0001	82.23	28.13
PBC-behaviour	6	0.268 (0.111–0.411)	<0.0001	69.66	16.48
Intention-behaviour	8	0.376 (0.244–0.494)	<0.0001	60.58	17.76

k = number of unique datasets

$r+$ = weighted correlation coefficient

I^2 = percentage of total variation due to heterogeneity

Q = between study heterogeneity expressed as a χ^2

* $p < 0.0001$

Table 2 Analysis of moderation of the intention-behaviour relationship by retrospective versus prospective behavioural assessment

	k	Q	*p* value
PBC-behaviour	6	1.15	0.28
Intention-behaviour	8	0.27	0.60

k = number of unique datasets

Q = between study heterogeneity expressed as a χ^2

Theoretical Implications

This meta-analysis suggests that the TPB is a useful model to guide research and increase understanding of condom use among MSM. The findings are consistent with Albarracin et al.'s [28] review and found significant relationships between TPB constructs, including behaviour. The one exception was that PBC, contrary to theoretical predictions, PBC was not significantly associated with behaviour when controlling for intention. This suggests that MSM are more likely to use condoms if they have formed intentions to do so, and these intentions reflect their attitude, SN, and PBC as related to condom use.

Across studies, the TPB explained 24.0 % of the variance in intention to use condoms and 12.4 % of the variance in condom use behaviour among MSM. When compared to previous TPB meta-analyses, whilst this is a much smaller than Albarracin et al. [28] who found intentions and behaviour explained approximately 25 % of the variance in future condom use behaviour, it is somewhat similar to McEachan et al. [25], who found that the TPB variables accounted for 13.8 % of the variance in safe sex behaviours. However, a large amount of variance in behaviour remains unexplained. It is possible that the diversity in the behaviours being measured across the relatively small number of studies within our meta-analysis may be responsible for some of the unexplained variance. It is important that constructs are measured in line with the principle of correspondence, i.e. that items are framed within the same target, action, context and time [73]; however, this is frequently not the case and may have reduced measurement accuracy and increased error variance across these studies. It is also worth considering that whilst the TPB may be a useful model for condom use for MSM in that intention was found to be associated with behaviour, more recent models have been put forth to try and close the intention behaviour gap that may be relevant

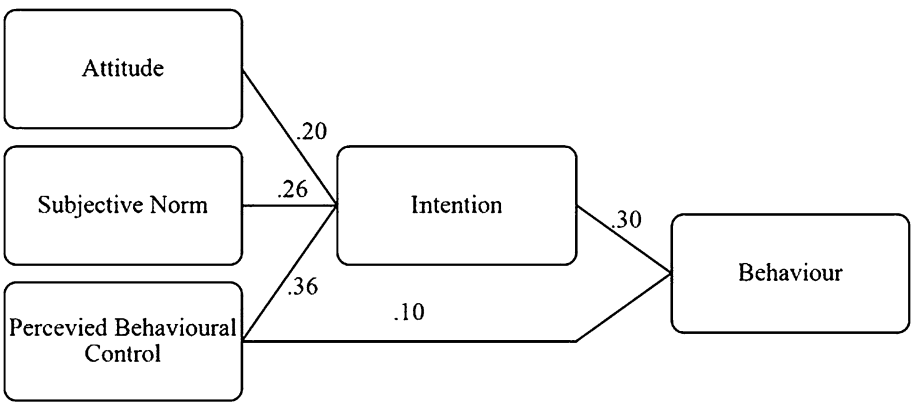

Fig. 2 Meta-analytic path analysis with estimated standardised regression weights for TPB relationships

to consider in this context. For example, the TPB has been extended into what is now called the integrative behaviour model [74], whereby the effectiveness of intention to be associated with behaviour is influenced by necessary skills for behavioural performance and potential environmental constraints on behaviour. In addition, stage models such as the health action process approach [75, 76] try to account for the temporal processes necessary for initiating and maintaining behaviour change, and propose that in addition to intention, behaviour is determined by self-regulatory processes, perceived self-efficacy, and planning.

These findings are consistent with the Albarracin et al. [28] review which included studies from among diverse populations (e.g., college students, injecting drug users, females, MSM), while we only utilised data taken from MSM populations. Different populations are subject to different biological, social, economic and cultural influences, which are hypothesised to be mediated by the TPB variables [29, 77]. Despite the apparent differences between the diverse populations included by Albarracin et al. [28], our meta-analysis, specific to MSM, yielded similar results. This suggests consistency in the TPB's ability to explain condom use among a wide variety of populations, including MSM.

The second aim of the current meta-analysis was to assess whether the behavioural measure used (cross-sectional or prospective) moderated the relationship between intention and behaviour. The limited predictive validity of the TPB has been criticised as a weakness of the model [20] and studies frequently fail to assess behaviour prospectively. Similarly, weaker relationships have typically been found for retrospective health behavioural measures when compared to prospective measures [25]. However, within the current review, that all included datasets tested the whole TPB model including actual behaviour, and six of the eight included data sets measured behaviour prospectively, shows reasonable methodological strengths among the majority of these studies. This suggests that even when condom use behaviour among MSM is assessed longitudinally, that associations between the TPB constructs remain robust, as seen in the moderate-large effects sizes within this review.

Unexpectedly, our analysis did not suggest that the nature of the behavioural measure used (retrospective or prospective) moderated the relationship between intention and behaviour. This was surprising given the evidence suggesting that intentions are more strongly associated with retrospective behavioural measures for a variety of health behaviours including condom use [78–81]. In a meta-analysis of only prospective studies of the extent to which TPB can explain health behaviours, McEachan et al. [25] found that category of behaviour being measured was a significant moderator of the explanatory value of the TPB. Notably, safer sex behaviours were relatively poorly explained by the TPB when compared to other health promoting behaviours such as physical activity and diet behaviours.

Our review included two studies that utilised retrospective behavioural measures, which limits its comparison with the McEachan et al. [25] review which solely used prospective measures. However, the majority of the studies within our meta-analysis utilised prospective behavioural measures of safer sex and yet the TPB associations remained robust.

Alike Albarracin et al. [28], McEachan et al. [25] also aggregated data from studies taken from diverse populations. Again, it may be that the TPB better accounts for condom use behaviour prospectively among MSM populations than it does for aggregated populations due to the different biological, social, economic, medical and cultural effects, which are mediated by the TPB [29, 77]. However, the small number of data sets included in the current meta-analysis results in issues of statistical power, and the moderation analysis must be considered within this limitation.

Limitations and Strengths

Due to the significant heterogeneity, the precision of the meta-analytic effect sizes is reduced, and the results must be considered with reference to this limitation. The small number of datasets included in the study restricts the ability to investigate moderators that may bear influence on the TPB relationships.

Another limitation of this study is that of publication bias. It is possible that all the studies that could have been included were not, and that those that were included, having been published were more likely to have positive results [82], therefore influencing the outcome of the completed analyses. Finally, as only studies published in English were included, relevant research published in other languages may have been missed.

The strength of this meta-analysis lies in the assessment of the TPB as it applies to condom use behaviour among MSM specifically. Instead of assessing the utility of the TPB in predicting an extensive range of health behaviours across broad and varied populations, this meta-analysis assesses the TPB as it applies to a specific behaviour among a specific population at heightened risk of HIV infection. In addition, this meta-analysis is temporally relevant to HIV-prevention and intervention as new methods such as ART, PreP, and PEP enter this domain.

Conclusion

The TPB has been successfully applied to a large range of health behaviours, and the findings of this review suggest that the TPB construct relationships are strong when applied to condom use among MSM. However, the moderate to high degree of heterogeneity in effect sizes across studies suggests that moderators not included in this meta-analysis influence the relationships between TPB variables. In addition, this review does not provide insight into the potential for success of TPB-based interventions to promote condom use among MSM. The small number of studies available for meta-analysis means that meaningful moderation analyses are difficult to complete, and provides a strong rationale for further predictive studies of the TPB among MSM populations. In conclusion, the results of this suggest that the TPB is a helpful model with which to better understand the processes involved in condom use among MSM.

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Compliance with Ethical Standards

Conflict of Interest The authors have no sources of funding or conflicts of interest to disclose.

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