Article

Screening and Brief Intervention for Substance Misuse: Does It Reduce Aggression and HIV-Related Risk Behaviours?

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Abstract

Purpose: To explore whether reducing substance misuse through a brief motivational intervention also reduces aggression and HIV risk behaviours.

Methods: Participants were enrolled in a randomized controlled trial in primary care if they screened positive for substance misuse. Substance misuse was assessed using the Alcohol, Smoking and Substance Involvement Screening Test; aggression, using a modified version of the Explicit Aggression Scale; and HIV risk, through a count of common risk behaviours. The intervention was received on the day of the baseline interview, with a 3-month follow-up.

Results: Participants who received the intervention were significantly more likely to reduce their alcohol use than those who did not; no effect was identified for other substances. In addition, participants who reduced substance misuse (whether as an effect of the intervention or not) also reduced aggression but not HIV risk behaviours.

Conclusions: Reducing substance misuse through any means reduces aggression; other interventions are needed for HIV risk reduction.

INTRODUCTION

Substance misuse is a key risk for adolescents, particularly since it is also associated with aggression and sexual risk behaviours. Binge drinking, underage drinking and marijuana use are all associated with sexual victimization (Champion *et al.*, 2004); correspondingly, substance misuse has been found to be associated with a range of sexual risk behaviours, such as early sexual debut, multiple partners and no or inconsistent condom use, and with the consequences of risk behaviours, such as sexually transmitted infections (including HIV) and unintended pregnancies (Fergusson and Lynskey, 1996; Kotchick *et al.*, 2001; Tapert *et al.*, 2001). Similarly, alcohol and illegal drug use are associated with aggression in young people (Valois *et al.*,

1995; Resnick *et al.*, 2004; Baxendale *et al.*, 2012). In both the case of aggression and sexual risk behaviours, the disinhibition and expectations of disinhibition associated with intoxication appear to be the mechanisms by which substance use is causally associated with risk behaviours (Fergusson and Lynskey, 1996; Anderson and Huesmann, 2003).

Three studies of interventions aimed at reducing alcohol-related aggression have been identified in the literature (McMurran, 2012; Goodall, 2015). The Control of Violence for Angry Impulsive Drinkers (COVAID) program is a 10-session cognitive behavioural therapy program that addresses both alcohol use and aggression, and aggression-related expectancies associated with alcohol (McCulloch

and McMurran, 2008). A small ($n = 10$) pre-post trial with long-term follow-up found a reduction in alcohol-related aggression that persisted (as measured by convictions for violent offences) to a mean follow-up time of 29 weeks (McCulloch and McMurran, 2008). The SafeRteens programme, by contrast, is an emergency-room-based brief intervention aimed at adolescents who are admitted for emergency medical treatment and who report both alcohol use and aggression (Cunningham *et al.*, 2010). SafeRteens takes advantage of the 'teachable moment' provided by an emergency room admission and used motivational interviewing combined with resetting norms and skills-training role-plays for conflict management and alcohol refusal (Cunningham *et al.*, 2009). A large randomized controlled trial ($n = 726$) compared three arms: receiving the intervention from a computer, receiving the intervention from a therapist and no intervention; this trial found that those who had received the intervention from a therapist or from a computer reported reductions in alcohol consequences at 6 months, and those in the therapist group also reported reductions in peer aggression (Cunningham *et al.*, 2010). Finally, a large randomized controlled trial comparing a brief intervention for alcohol misuse with a single-session version of COVAID (focused on both alcohol and aggression) in facial trauma patients found reduction in drinking but none in aggression in both arms at 12-month follow-up (Goodall *et al.*, 2012). Studies of substance abuse treatment and aggression thus typically examine only interventions that include a specific focus on aggression and—with one exception (Goodall *et al.*, 2012)—do not examine whether simply reducing substance misuse is sufficient also to reduce aggression. This is despite a robust set of studies finding that many brief interventions in trauma settings for alcohol use alone do reduce trauma and injury recidivism, implying that there may be some effect on aggression (Nilsen *et al.*, 2008).

The literature on sexual risk behaviour reduction through treatment for substance misuse also tends not to examine whether reducing substance misuse is, on its own, sufficient to reduce sexual risk behaviours. A review of drug abuse treatments for HIV prevention found that studies focused primarily on methadone maintenance treatments; these were found to be effective in reducing both HIV risk behaviours (mainly needle-sharing) and HIV infection (Sorenson and Copeland, 2000). Alternatively, the reduction in sexual risk behaviours is achieved through an intervention targeted specifically at these risk behaviours and integrated into substance abuse treatment (Prendergast *et al.*, 2001; Lewis *et al.*, 2014). However, (1) a 16-week culturally tailored cognitive behavioural treatment for methamphetamine dependence also reduced sexual risk behaviours (Shoptaw *et al.*, 2005), and (2) there are some studies (of treatment for alcohol and for cocaine abuse) that found that sexual risk behaviours did reduce once substance misuse reduced, without any treatment specific to the sexual risk behaviours (Metzger *et al.*, 1998; Gossop *et al.*, 2002).

If substance misuse increases the likelihood of aggression and of sexual risk behaviours via intoxication, it follows that reductions in substance misuse should also reduce these risk behaviours, without necessitating an additional intervention targeting aggressive or sexual risk behaviours. Surprisingly, this hypothesis appears to have received very little attention in studies of substance abuse treatment. Further, screening and brief interventions for substance misuse are gaining in popularity because of their low cost, effectiveness and potential for integration into other health systems (Bertholet *et al.*, 2005; Babor *et al.*, 2006; Institute of Medicine, 2006; Moyer, 2013); it would be enormously helpful if this mode of delivery of substance abuse treatment also reduced other risk behaviours.

We had conducted a randomized controlled trial, which found that a single brief motivational interview did reduce alcohol misuse in

young South Africans (Mertens *et al.*, 2014); we took advantage of this and reanalysed data from the trial to investigate further whether reductions in substance misuse would also be associated with reductions in aggression and sexual risk behaviours.

METHODS

Sample

Patients aged 18–24 presenting to a community health centre for primary care in Cape Town, South Africa, were screened for substance misuse ($N = 2047$). Because evidence for screening tools in young adults is not strong (Jonas *et al.*, 2012; Patton *et al.*, 2014) and because of time pressure on services in the health centre, we used single-item screening questions for alcohol and for drugs (Smith *et al.*, 2009), an approach now recommended by the National Institute on Drug Abuse (NIDA) and used in health plans (NIDA, 2011). To screen for alcohol use in women, we asked: 'In the past year, how many times have you had 3 or more drinks on one occasion?', and in men we asked: 'In the past year, how many times have you had 5 or more drinks on one occasion?'. To screen for use of other drugs, we asked: 'In the past three months, how many times have you used drugs? When I talk about a drug here, I don't mean cigarettes or snuff. I mean drugs like dagga [cannabis], mandrax [methaqualone], tik [crystal methamphetamine], cocaine, heroin, LSD, or sleeping pills or other medication that you have used in a way that it was not prescribed, or not prescribed for you'. In a previous study in the same population, we found positive answers to these questions to have 83% sensitivity and 93% specificity for identifying alcohol use assessed by the AUDIT and 92% sensitivity and 99% specificity for risky drug use assessed by the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) (Mertens *et al.*, 2008).

Of those screened, 1478 were excluded, because they screened negative ($n = 1370$), were too ill to participate ($n = 22$) or had no telephone and therefore could not be followed ($n = 86$). A further 88 patients who screened positive refused the opportunity to participate in the study and were given an information sheet listing other treatment agencies in Cape Town. A total of 57 left the clinic before they could be approached for recruitment, and 21 were excluded from the analysis because of baseline data loss due to mobile device failure. Figure 1 provides the CONSORT diagram for the study.

Measures

After screening positive, substance misuse was assessed using the WHO ASSIST 3.0 (WHO ASSIST Working Group, 2002), which provides scores for each substance that can be categorized into low/zero- and medium/high-risk use.

Aggression was assessed using a slightly modified form of the Explicit Aggression Scale (Barnwell *et al.*, 2006). The original scale assessed aggression while drinking; we were also interested in the effects of illicit substances and so adapted the scale so that questions read (for instance) 'How many times in the past 3 months have you been involved in a physical fight while drinking or using drugs?' Because we were concerned about subject burden in an already lengthy questionnaire, we only asked the 13 questions from the Explicit Aggression Scale that dealt with aggression after substance use. The Explicit Aggression Scale is based on the questions asked in the Revised Conflict Tactics Scale (Straus *et al.*, 1996) but deals only with the less serious and therefore more frequent forms of aggression (slapping, yelling, threatening to hurt, pushing, breaking things, pulling hair, twisting someone's arm, arguing, throwing things in anger,

Fig. 1. CONSORT flowchart.

saying hurtful things to someone or about someone). It does not deal with the more serious (and less frequent) forms such as beating, stabbing or rape.

HIV risk behaviour was assessed as a count of positive answers to six questions (Avalos *et al.*, 2009), which asked whether the following had occurred in the last 3 months: having a partner who had engaged in transactional sex, who was a man who had had sex with a man, who used injection drugs and who had a sexually transmitted infection; having multiple partners; or failure to use a condom at last intercourse.

Procedure

The remaining 403 patients who screened positive and who agreed to participate in the study were interviewed in a private setting about their substance misuse, substance-related aggression and HIV risk behaviours. The study was approved by the institutional review boards of the University of Cape Town, South Africa; the Human Sciences Research Council in South Africa; and the Division of Research,

Kaiser Permanente, USA. Participants gave informed consent before being enrolled in the study.

After screening, half of the participants were randomly assigned (using block randomization) to receive a brief motivational intervention plus a referral resource list ($n = 206$); the other half ($n = 197$) received usual care plus a referral resource list (minimally enhanced usual care or mEUC; Freedland *et al.*, 2011). Trained nurse practitioners used the procedures outlined in *Health Behaviour Change: A Guide for Practitioners* (Rollnick *et al.*, 1999) to carry out brief motivational interventions addressing alcohol and drug use and were supervised weekly in order to ensure fidelity of the intervention. Both the groups were interviewed again (in person) 3 months later. Incentives (in the form of a grocery store or cell phone voucher, to the value of ZAR50—approximately USD4.50) were offered to participants who completed follow-up interviews. Participants who came to the clinic for their follow-up interviews were reimbursed for their transport costs; otherwise, we visited their homes to complete the follow-up interviews.

For further details about the study, please see [Mertens et al. \(2014\)](#); here, we present an analysis of the data specifically concerning the aggressive and HIV-related risk behaviour outcomes.

Data analysis

We summarized the prevalence of substance misuse, aggression and HIV risk behaviour using frequencies and percentage frequencies. We summarized the association between substance use reduction and aggression at different time points using frequencies and percentage frequencies for the intervention and control groups separately and overall. We summarized the association between substance use reduction and HIV risk behaviour at different time points using means and standard errors for the intervention and control groups separately and overall. For each patient, we determined the change in HIV risk behaviour at follow-up compared with baseline by calculating the difference in the summed counts. A negative difference indicated a decrease in HIV risk behaviour and vice versa. We illustrated the distribution of these changes using a percentage histogram and compared these differences in the change in HIV risk behaviour between those patients who reduced substance use and those who did not reduce substance use using a Kruskal–Wallis test.

A large number of participants (50%) reported zero aggression at either baseline or follow-up. Because of this large percentage of zero scores, a zero-inflated negative binomial regression model ([Long, 1997](#); [Long and Freese, 2001](#)) was used to investigate the relationship between reductions in total substance misuse scores and aggression scores in the full sample, and again in the group that used alcohol at risky levels. This model assumes that some of the zeroes are structural zeroes in that some respondents have no propensity for violence (33% of all respondents recorded a zero score for aggression at both time points). It thus models both the relative risk of a zero score (using a logistic model) and the relative increase in the mean score (using a negative binomial model) as a function of the predictor variables. As predictor variables we included an indicator variable for substance use reduction (defined as any reduction in ASSIST scores), time (baseline and follow-up) and their interaction (to test whether the change in aggression scores over time is the same for those who reduced substance use and those who did not), as well as an intervention group indicator. The model, therefore, allows us to explore the following: (1) whether there was an effect of intervention versus mEUC group on aggression, and (2) whether any reduction in substance misuse (regardless of intervention or mEUC group membership) was associated with a reduction in aggression over time. We used robust standard errors to take into account the repeated measures at the two time points within subjects.

We used this modelling approach to explore the role of participants' total substance misuse scores, as our hypothesis was that any reduction in substance misuse would lead to a concomitant reduction in risk behaviour scores. We used the same modelling approach in the specific sub-group who used alcohol at risky levels, because of alcohol's strong association with aggression ([Anderson, 2015](#)), and because our previous work demonstrated that significantly more people in the intervention group compared with the mEUC group reduced their alcohol use and risk (38 versus 21%, respectively; $F = 4.79$, $P = 0.0293$), and that this was the only substance for which the intervention appeared to have an effect ([Mertens et al., 2014](#)).

In the current paper, we therefore examined whether less overall substance misuse had an impact on aggressive and HIV risk behaviours, and the same question in the sub-group that used alcohol at risky levels.

Table 1. Prevalence of substance misuse and risk behaviours by substance misuse category (N = 363)

Substance	Risk category	Substance misuse at baseline (n, % of sample)	Substance misuse at follow-up (n, % of sample)	n reporting any aggression at baseline (n, % of substance risk group) ^a	n reporting any aggression at follow-up (n, % of substance risk group)	n reporting any sexual risk at baseline (n, % of substance risk group)	n reporting any sexual risk at follow-up (n, % of substance risk group)
Alcohol	No/low-risk use	176 (48.5)	245 (67.5)	93 (52.8)	80 (32.6)	123 (69.9)	171 (69.8)
	Risky use	187 (51.5)	118 (32.5)	130 (69.5)	118 (63.1)	164 (87.2)	95 (80.5)
Cannabis	No/low-risk use	288 (79.3)	316 (87.1)	161 (55.9)	109 (34.5)	240 (83.3)	234 (74.1)
	Risky use	74 (20.4)	47 (12.9)	62 (83.8)	33 (70.2)	47 (63.5)	32 (68.1)
Methaqualone	No/low-risk use	352 (97.0)	359 (98.9)	213 (60.5)	138 (38.4)	282 (80.1)	263 (73.3)
	Risky use	10 (2.8)	4 (1.1)	10 (100.0)	4 (100.0)	5 (50.0)	3 (75.0)
Cocaine	No/low-risk use	362 (99.7)	363 (100)	223 (61.6)	142 (39.1)	287 (79.3)	266 (73.3)
	Risky use	1 (0.3)	0	0	0	0	0
Methamphetamine	No/low-risk use	329 (90.6)	347 (95.6)	192 (58.4)	126 (36.3)	263 (79.9)	255 (73.4)
	Risky use	33 (9.1)	16 (4.4)	31 (93.9)	16 (100.0)	24 (72.3)	11 (68.8)
Sedatives	No/low-risk use	357 (98.3)	363 (100)	218 (61.1)	142 (39.1)	283 (79.3)	266 (73.3)
	Risky use	5 (1.4)	0	5 (100.0)	0	4 (80.0)	0

^an, % of substance risk group^a—i.e. these are row percentages: the percentage of the low/no-risk group or the risky use group that reported either aggression or sexual risk at these time points.

RESULTS

A total of 363 patients completed both baseline and follow-up interviews, with a follow-up rate of 90% (please see Fig. 1 for further details). Those lost to follow-up were more likely to fall in the low-risk groups (Mertens *et al.*, 2014). No participant reported use of heroin or inhalants; alcohol was the substance most used at risky levels, with half of the sample that was followed up (51.5%) using it at risky levels at baseline (see Table 1 for a report of substance use by category and of aggression and HIV risk behaviours by substance and whether that substance was used at risky levels).

Participants reported the full range of possible aggression scores (0–39) at baseline, with a median of 2 (interquartile range 0–9). The majority of the sample (223; 61.43%) reported zero aggression at baseline, which accounts for the low mean value. For the HIV risk behaviours, total scores ranging from 0 to 6 were possible, actual scores ranged from 0 ($n = 76$; 20.94%) to 4 ($n = 2$, 0.55%) at baseline and at follow-up from 0 ($n = 97$, 26.72%) to 5 ($n = 1$, 0.28%). At baseline, the majority (268; 73.83%) reported one or two HIV risk behaviours in the prior 3 months and similarly in the past 3 months at follow-up ($n = 253$; 69.70%).

Table 2 describes the proportions of the sample who had zero aggression and breaks this down by use of any substance at risky levels and use of alcohol at risky levels, intervention versus mEUC group and within those, into sub-groups of those who reduced or did not reduce their substance misuse. The table also provides the mean and standard error for the HIV risk behaviours for each group. In both the intervention and mEUC groups, whether in the group that used any substance or just the sub-group that used alcohol at risky levels, there is an increase in zero aggression scores from baseline to follow-up. Those who reduced their substance misuse also consistently show an increase in zero aggression scores from baseline to follow-up. However, there is very little change or variation by group in the HIV risk behaviour scores.

The relationship between reductions in total substance misuse scores and aggression scores in the full sample is reported in Table 3 and further explored in the sub-group that used alcohol at risky levels (see Table 4). The exponentiated coefficients of the two components of the zero-inflated models can be interpreted as estimates of (1) the relative odds of a zero versus nonzero score and (2) the ratio of the mean scores in two groups. Among those in the full sample who

Table 2. Aggression and HIV risk scores by intervention and mEUC groups and substance use reduction status

Group	Substance use reduced?	Percentage ^a with zero aggression score, % (<i>n</i>)		HIV risk score, mean (S.E.)	
		Baseline	Follow-up	Baseline	Follow-up
Aggression scores in the full sample					
Intervention group (<i>n</i> = 173)	Non-reducer (<i>n</i> = 52)	48 (25)	42 (22)	1.10 (0.11)	1.29 (0.12)
	Reducer (<i>n</i> = 121)	33 (40)	60 (73)	1.20 (0.08)	1.13 (0.08)
	Total	37 (64)	55 (95)	1.23 (0.06)	1.18 (0.07)
mEUC group (<i>n</i> = 190)	Non-reducer (<i>n</i> = 39)	49 (19)	54 (21)	1.33 (0.13)	1.23 (0.12)
	Reducer (<i>n</i> = 151)	37 (56)	69 (105)	1.21 (0.07)	1.11 (0.08)
	Total	39 (75 of 190)	66 (126 of 190)	1.24 (0.06)	1.14 (0.07)
Aggression scores in the subgroup of participants who used alcohol at risky levels					
Intervention group (<i>n</i> = 84)	Non-reducer (<i>n</i> = 14)	57 (8)	45 (15 of 33)	1.21 (0.19)	1.24 (0.14)
	Reducer (<i>n</i> = 70)	27 (19)	39 (9)	1.42 (0.10)	1.22 (0.18)
	Total	32 (27)	43 (24)	1.39 (0.09)	1.23 (0.11)
mEUC group (<i>n</i> = 103)	Non-reducer (<i>n</i> = 18)	44 (8)	58 (15)	1.44 (0.18)	1.27 (0.14)
	Reducer (<i>n</i> = 85)	26 (22)	47 (17)	1.36 (0.09)	1.31 (0.18)
	Total	29 (30)	52 (32)	1.37 (0.08)	1.29 (0.12)

^aPercentages here are row percentages: percentages of reducers (or non-reducers) in the intervention or mEUC groups.

Table 3. Relationship between substance use and aggression scores in the full sample

Nonzero scores	Ratio of mean aggression scores	<i>P</i>	95% CI
Time (follow-up versus baseline)			
Among substance use reducers	0.79	0.014	(0.66; 0.95)
Among non-reducers	1.11	0.595	(0.75; 1.65)
Intervention group versus control group	1.08	0.406	(0.89; 1.34)
Relative odds of a zero aggression score			
	Odds ratio	<i>P</i>	95% CI
Time (follow-up versus baseline)			
Among substance use reducers	3.71	<0.000	(2.72; 5.10)
Among non-reducers	0.98	0.949	(0.58; 1.66)
Intervention group versus control group	0.75	0.155	(0.50; 1.12)

Estimated from a zero-inflated negative binomial models for aggression scores that included time (follow-up versus baseline), substance use reduction (yes versus no), the time*reduction interaction and the intervention group versus control group indicator.

Table 4. Relationship between substance use and aggression scores among alcohol users only

Nonzero scores	Ratio of mean aggression scores	<i>P</i>	95% CI
Time (follow-up versus baseline)			
Among substance use reducers	0.86	0.320	(0.66; 1.15)
Among non-reducers	1.96	0.879	(0.53; 1.71)
Intervention group versus control group	1.03	0.801	(0.81; 1.32)
Relative odds of a zero aggression score	Odds ratio	<i>P</i>	95% CI
Time (follow-up versus baseline)			
Among substance use reducers	2.32	0.010	(1.22; 4.42)
Among non-reducers	1.04	0.930	(0.41; 2.63)
Intervention group versus control group	0.91	0.747	(0.51; 1.62)

Estimated from a zero-inflated negative binomial models for aggression scores that included time (follow-up versus baseline), substance use reduction (yes versus no), the time*reduction interaction and the intervention group versus control group indicator.

Fig. 2. Change in six-item HIV Risk score among those who did not and who did reduce substance use.

reduced their overall substance use, there was a significant reduction in aggressive behaviour, indicated by the reduction in means of scores (ratio of means, follow-up versus baseline = 0.79, $P = 0.014$) and by the increased odds of a zero score at follow-up compared with baseline ($OR = 3.71$, $P < 0.0001$). In the sub-group with risky levels of alcohol use, we observed a similar reduction in terms of the increased odds of a zero score at follow-up that was significant ($OR = 2.32$, $P = 0.010$); the reduction in mean aggression scores ($OR = 0.86$, $P = 0.320$) was not significantly different between those who reduced their substance use at follow-up and those who did not. In the participants in both the full and alcohol risk sub-samples who did not reduce substance use, there was no significant change in aggression scores, whether means or the odds of a zero aggression score were compared. In addition, there was no effect of intervention group on these findings, indicating that the change in substance use, and not the intervention itself, was the factor associated with change in aggressive behaviour.

Figure 2 illustrates the frequency distributions of the different levels of HIV risk behaviour change among patients who did and who did not reduce substance use, respectively. There is an indication of higher percentages of decreased HIV risk scores (i.e. negative changes) among those who did not reduce their substance use and higher percentages of increased HIV risk scores (i.e. positive changes) among those who did reduce their substance use. However, the median

change was zero for both groups, and the groups did not differ significantly, Kruskal–Wallis P -value = 0.3086.

DISCUSSION

Our findings suggest that reducing substance misuse may be associated with a reduction in aggressive behaviour but that this is not so for HIV risk behaviours.

In contrast to the only other trial we could identify that examined a brief intervention for substance misuse and its effect on aggression (Goodall *et al.*, 2012), we found that reducing substance misuse did reduce aggression. However, one key similarity between our results and those of Goodall *et al.* (2012) was that there was no effect of intervention group on the aggression outcome, despite the fact that the intervention group did reduce their substance use more than the control group. In essence, we have thus found that our intervention did reduce substance misuse, and reduction in substance misuse was related to reduction in aggression—but reduction in aggression was not greater in the intervention group. This is possibly because both the intervention and control groups reduced their substance misuse, and the difference between the two groups was small—as might be expected from a very light-touch intervention. The reduction in substance misuse in both groups may have been partly due to participant reactivity—that is, the baseline assessment itself performed as an intervention (Walters *et al.*, 2009). In addition, of course, our intervention did not directly address aggression and its relationship to substance misuse.

Given this, our results thus imply that reduction in substance misuse for any reason, with or without a substance abuse intervention, is what leads to reductions in aggression and that therefore public health efforts to reduce aggression should be broadly focused on attempts to reduce substance use—through any means available. Such means might indeed include interventions such as screening and brief motivational interviewing but might also include a wide range of initiatives directed at controlling the supply and demand sides of substance availability, as well as efforts to improve safety in drinking establishments (Anderson, 2015).

HIV risk behaviours, on the other hand, were not reduced, whether or not participants reduced their substance use. While studies do suggest that sexual risk behaviours are associated with intoxication—and therefore might reasonably reduce if intoxication is reduced (Fergusson and Lynskey, 1996)—other literature suggests that sexual risk behaviours occur in a more complex context than

the simple relationship between intoxication and alcohol. For instance, the nature of the relationship, its length and partners' experiences of trust and intimacy (Halpern-Felsher *et al.*, 1996) and patterns of substance misuse (such as binge-drinking and marijuana use; Guo *et al.*, 2002) may be more important in sexual risk behaviour than simply use of substances. Interventions that focus on social norms and views of peers may also be effective in reducing HIV risk and are brief to implement and so could practically be integrated into brief substance abuse treatments. Norms feedback interventions have proven useful in reducing both substance misuse (Neville, 2015) and HIV risk behaviours (Kelly *et al.*, 1991) separately, and so there is reason to believe that a combined intervention would be helpful. This may be a fruitful area for future research.

Our results suggest, therefore, that reducing substance misuse (through any means) can reduce aggression, at least in minor forms such as yelling and slapping that may precede more serious forms, but they do not speak to more serious forms of aggression. Future research should explore whether serious aggression is also reduced through reducing substance misuse. Given the small number of participants who did respond to our intervention by reducing their substance use, future research might also explore whether a more intensive intervention, such as several sessions of motivational interviewing, instead of just one, might be more effective in reducing both substance misuse and aggression—and possibly even HIV risk behaviours. Future research should also explore whether the effects of such interventions are maintained. While some trials show effects at several months after one brief intervention (see, for instance, WHO Brief Intervention Study Group, 1996, which showed effects at 9 months post-intervention), many preventive interventions show a drop-off of effect over time (Nation *et al.*, 2003).

The possibilities of other interventions, such as brief motivational interviewing combined with problem-solving therapy (Sorsdahl *et al.*, 2014), should also be explored; as should the question of whether interventions to reduce aggression and HIV risk behaviours must be integrated into substance abuse treatments in order to achieve reductions in those related risk behaviours as well as in substance misuse (Sorenson and Copeland, 2000; Prendergast *et al.*, 2001; McCulloch and McMurran, 2008; Cunningham *et al.*, 2010).

In the South African context (as in many other low- and middle-income countries), there are twin problems with regard to intervening in risk behaviours: substance abuse, aggression and HIV risk behaviours all occur at high levels (Coovadia *et al.*, 2009), yet there also is a dearth of professionals available to deliver interventions (Hanson *et al.*, 2010). Substance misuse also plays a key role in both aggression and HIV risk. It is crucial, therefore, that interventions that address substance misuse in such a way that both aggression and HIV risk are also reduced are developed, which are sufficiently simple for delivery by paraprofessionals and which can easily be integrated into existing service systems (Weisner and Schmidt, 2001). Brief motivational interventions are precisely the kind of intervention that appear to meet these criteria: their simple delivery format means that paraprofessionals can probably be trained to deliver them, and their brevity makes them easier to integrate into service systems than longer, more complex interventions. For these reasons, in contexts such as South Africa, they are very attractive. Yet our results suggest that perhaps the simplest of such interventions—screening and a single-session brief motivational intervention—while it can reduce alcohol use (Mertens *et al.*, 2014), is not sufficient to achieve the goal of reducing substance use as well as aggression and HIV risk behaviour. It may be that multiple session brief motivational interventions are needed to decrease substance misuse sufficiently to have an

impact on HIV risk behaviours. Alternatively, other, only slightly more complex, interventions are being developed for precisely this context (Sorsdahl *et al.*, 2014). Their promise to achieve reductions in substance misuse, and in other risk behaviours, must urgently be explored further.

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CONFLICT OF INTEREST STATEMENT

None declared.

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