The efficacy of methadone maintenance interventions in reducing illicit opiate use, HIV risk behavior and criminality: a meta-analysis

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Authors' objectives
To investigate the effect of methadone maintenance treatment (MMT) on three outcome measures: illicit opiate use, criminal activities and HIV risk behaviours.

Searching
MEDLINE, PsycLIT and PsycINFO databases were searched from 1965 to 1994 for English language articles. Cross-referencing procedures of obtained study reports were undertaken.

Study selection
Study designs of evaluations included in the review
Qualitative non-residential studies in which fixed-dose schedules of methadone administration were followed on a daily basis, independent of recent illicit drug use and accompanied by ancillary services, and patients were evaluated both before and after admission to treatment. Both experimental control between-subjects design and repeated measures design studies were included.

Specific interventions included in the review
Methadone hydrochloride given in fixed doses on a daily non-residential basis and accompanied by ancillary services, in the maintenance (not detoxification) phase of treatment.

Participants included in the review
Those having received an opiate-dependent substance-abuse diagnosis without any concurrent psychiatric diagnoses.

Outcomes assessed in the review
1. Opiate use:
   Assessed either objectively using thin-layer chromatography or the enzyme multiplied immunoassay test to analyse urine, or by self-reported measures of drug use, such as the Addiction Severity Index.

2. Criminal activities:
   Assessment based on data from both self-report and legal records of arrests, incarcerations and charge rates.

3. HIV risk behaviours:
   Assessment based on self-reported intravenous drug use, needle-sharing practices and sexual risk behaviours.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The author does not state that they assessed validity.

Data extraction
All data entry procedures and analyses were done twice to ensure their accuracy. It is not stated whether one or two
reviewers were involved.

**Methods of synthesis**

*How were the studies combined?*

For each of the three outcome measures, the Stouffer Combined Test, in which p-values were converted to standardised normal deviate Z-values, was used to combine significance levels across studies. Weighted (by sample size) and unweighted results were determined. The magnitude of the experimental effect across studies was determined using Fisher's Z (Zr) procedures. Studies with two or more dependent variables were combined such that their z and zr values were averaged to obtain a composite p-value and effect size for each study.

If only aggregate data were presented within a study, non-parametric procedures were employed. Z test of proportions for categorical data was used to test for a significant difference between two independent proportions. McNemar Change Test was used to test for a significant difference between two correlated proportions. The Chi-square goodness of fit test was used to test for a significant difference between correlated proportions, when information on individual participants was not given. In studies where outcomes were assessed at multiple timepoints, the 12-month timepoint was used. Where post-admission groups were smaller than pre-admission groups due to attrition, the pre-admission sample size was used.

The potential effect of unpublished study findings were estimated using Cooper's 'fail-safe N' method.

*How were differences between studies investigated?*

For each outcome measure, tests of homogeneity of the studies' effect sizes and significance level distributions were conducted. The statistical significance of the heterogeneity of the independent effect sizes and significance levels was obtained by using the nonparametric chi-square test. In comparing significance levels, p-values were first converted to standardised normal deviate Z-values and then compared to a weighted mean Z-value. In comparing effect sizes, r-values were converted to Fisher's Z (Zr) scores and compared to a weighted mean Zr score, in determining an overall level of significance via the chi-square test.

**Results of the review**

There were 11 studies (2,056 participants) with illicit opiate use as the outcome measure. There were 24 studies (7,173 participants) with criminal activities as the outcome measure. There were 8 studies (at least 1,797 participants) with HIV risk behaviours as the outcome measure.

Analyses of the significance levels and effect sizes of studies investigating the effectiveness of methadone maintenance interventions in reducing illicit opiate use reveal an overall significant favourable effect. The effect on HIV risk behaviours and on drug- and property-related criminal behaviours is also significant and favourable.

Illicit opiate use (11 studies): Comparison of p-values indicate the studies' significance levels are homogeneous (\(\chi^2(10)=8.98, p=0.53\)). However, comparison of effect sizes gives a significantly heterogeneous result (\(\chi^2(10)=40.00, p=0.00\)). Combination of significance levels gave an unweighted p-value of \(p=0.00\), associated Z for combination = 9.61. Weighted by sample size, the results were \(p<0.00\), associated Z for combination = 6.37. The fail-safe N procedure gave a result of 364. Combination of effect sizes gave an unweighted r of 0.35, \(d=0.75\), associated Fisher's Z for combination = 0.36. Weighted by sample size, the results were \(r=0.18, d=0.38\), associated Fisher's Z for combination=0.19.

HIV risk behaviours (8 studies): Comparison of p-values indicated the studies' significance levels are homogeneous (\(\chi^2(7)=4.05, p=0.78\)). Comparison of studies' effect sizes also demonstrated homogeneity (\(\chi^2(7)=6.52, p=0.48\)). Combination of significance levels gave an unweighted p-value of \(p=0.00\), associated Z for combination = 7.50. Weighted by sample size, the results were \(p=0.00\), associated Z for combination=7.01. Fail-safe N calculations gave a result of 158. Combination of effect sizes gave an unweighted r of 0.21, \(d=0.44\), associated Fisher's Z=0.22. Weighted by sample size the results were \(r=0.18, d=0.37\), associated Fisher's Z =0.18.

Criminal behaviours (24 studies): Comparison of p-values indicate significant heterogeneity (\(\chi^2(23)=89.42, p=0.00\)) in studies' significance levels. If 6 studies with non-significant p-values are omitted (details in the paper), the remaining
significance levels become homogeneous (\(2(17)=18.63, p=0.35\)). Comparison of effect sizes also indicates significant heterogeneity (\(2(23)=90.24, p=0.00\)). Studies were then organised according to type of crime assessed (drug-related, property-related, non-drug-related). Studies in which type of crime was not specified were excluded from further analysis. Effect sizes of studies in each sub-group were now found to be homogeneous but the number of studies was very small.

Combination of significance levels gave an unweighted result of \(p=0.00\), associated \(Z\) for combination=13.93. Weighted by sample size, results were \(p=0.00\), \(Z\) for combination=10.93. Fail safe \(N\) calculations gave a result of 1697.

Combination of effect sizes gave an unweighted result of \(r=0.25\), \(d=0.5201\), associated Fisher's \(Z=0.26\). Weighted by sample size the results were \(r=0.16\), \(d=0.33\), associated Fisher's \(Z=0.16\).

Authors' conclusions
The results demonstrate a consistent, statistically-significant relationship between MMT and the reduction of illicit opiate use, HIV risk behaviours and drug and property-related criminal behaviours. The effectiveness of MMT is most apparent in its ability to reduce drug-related criminal behaviours. MMT had a moderate effect in reducing illicit opiate use and drug and property-related criminal behaviours, and a small to moderate effect in reducing HIV risk behaviours. The following figures are given in the discussion, however, in a sample of 200 opiate-dependent individuals in methadone treatment, we would expect, from the results of this meta-analysis, approximately 135 (67%) to decrease their illicit opiate use, 122 (61%) to decrease their HIV risk behaviours, 170 (85%) to decrease their drug-related criminal behaviours, 123 (61%) to decrease their drug- and property-related criminal behaviours and 117 (58%) to decrease their drug- and non-drug related criminal behaviours.

CRD commentary
The review begins well, with a specified objective and some details of the search procedure. Methods of assessing homogeneity and combining study results are described in detail and the issue of publication bias is addressed by use of the 'fail-safe \(N\)' procedure. However, there are a number of flaws in this meta-analysis. The studies were not assessed for quality of study design and, although details from each study, including demographic data, are reported, in some places data are missing without explanation: most notably in Table 2, where two studies by the same author are combined and a mean sample size is given. Although the results of the studies were assessed for heterogeneity, study design and characteristics of study participants were not assessed in this way. The reporting of the results of the meta-analysis is confusing, particularly in the 'Criminal behaviours' group where, to achieve homogeneity in the studies' results, 6 studies with non-significant \(p\)-values are dropped from the analysis. There is no explanation given to justify this procedure.

The author does not summarise her findings or state any conclusions, but does state that findings from these analyses must be generalised with caution. This statement is justified.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.