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Michalczuk R, Mitchell A

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[Intervention Review]

Monetary incentives for schizophrenia

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ABSTRACT

Background

There is evidence suggesting that people with serious mental illness are less responsive to everyday social rewards such as praise. Motivation and performance in social situations can be poor. Rewarding of tasks with money improves motivation to complete the tasks in everyday life. Careful use of targeted monetary rewards could also help people with troublesome symptoms of schizophrenia.

Objectives

To assess the effect of monetary incentive/rewards for people with schizophrenia or schizophrenia-like illness.

Search methods

We searched the Cochrane Schizophrenia Group's Register (June 2008).

Selection criteria

All relevant randomised controlled trials comparing monetary rewards with standard care or no monetary rewards.

Data collection and analysis

Working independently, we selected studies for quality assessment and extracted relevant data. We analysed on an intention-to-treat basis. Where possible and appropriate we calculated the Relative Risk (RR) and their 95% confidence intervals (CI). For continuous data we calculated weighted mean differences (MD) and their 95% confidence intervals.

Main results

Five trials are excluded that investigate one type of monetary reward over another and may be included in a future update. We did include one study, carried out over 40 years ago, randomising a total of 25 very chronically ill people who had been in hospital an average of 20 years. The targeted task that was being encouraged was assembly of dolls. People allocated to the payment group produced less dolls than those not paid at all although this difference did not reach conventional levels of statistical significance (MD -0.80 CI -1.44 to -0.16).

Authors' conclusions

Monetary rewards have been the topic for sporadic evaluative research for decades and this review shows that randomised studies are possible. We suggest a design for a future informative trial.

PLAIN LANGUAGE SUMMARY

Monetary incentives for schizophrenia

Money incentivises many. It has been used in experiments to promote various behaviours in people with schizophrenia. We found six trials, but only one compared monetary incentives to no incentives which was the focus of this particular review. This one, very small, study was undertaken in the early 1960s with people who had been in hospital for an average of two decades. It found no clear effect but little can be concluded from this outdated trial except that such studies are possible. We think more studies relevant to current circumstances are desirable.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Monetary reward compared with no monetary reward for schizophrenia

Patient or population: patients with schizophrenia[1]
Settings: in hospital in UK in 1960s[2]
Intervention: Monetary reward[3]
Comparison: no monetary reward

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	No of Participants (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	no monetary reward	Monetary reward				
Target behaviour: average number of dolls assembled per day		The mean Target behaviour: average number of dolls assembled per day in the intervention groups was **0.8 lower** (1.41 to 0.19 lower)		25 (1 study)	⊕◯◯◯ **very low**[4,5,6]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval;

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1] Very chronically ill, not actively psychotic
[2] Average stay in hospital - 20 years
[3] £0 s0 6d (1/40 th of one pound sterling)
[4] Randomisation not well described

[5] Work was assembling dolls in hospital workshop
[6] Small study, likely others are unpublished or in dissertations only

BACKGROUND

Description of the condition

Schizophrenia is an illness that can affect a person's ability to think, feel, perceive, and move (Hirsch 2003). It can affect anyone in the world irrespective of race, religion, social-economic level or culture, with men and women being equally at risk. About one per cent of people will develop schizophrenia in their lifetime. Characteristically, symptoms of schizophrenia fall into two main categories - the 'positive' symptoms of delusions, hallucinations and disorder of thinking, and the 'negative' symptoms of apathy, poverty of thought and poor volition (Crow 1985).

Description of the intervention

Treatments for schizophrenia and other similar serious mental illnesses are pharmacological, psychological and/or social. Drugs are a mainstay of treatment but use of these is often accompanied by a psychosocial approach. Some of these approaches have their roots in behavioural theory, one such approach is behavioural reinforcement. This is the modification of behaviour through the use of positive and/or negative reinforcement (Skinner 1957). Monetary incentives are positive reinforcements given for completion of tasks or improvements in behaviour. For those living independently, they can be given in the context of real-world employment or a living allowance. For those in more constrained and potentially institutionalised environments such as sheltered employment or hospital, monetary rewards may be given but the level may be low and, therefore, be more symbolic rather than of value in the real world. At some point these low financial incentives represent tokens rather than real money.

How the intervention might work

There is evidence suggesting that people with serious mental illness are less responsive to everyday social rewards such as praise (Layne 1982). Motivation can be poor, and in general they do not perform well in social situations. It is not clear whether this is a result of structural alterations to the brain which directly affect behaviour or a psychological reaction to illness (Goldstein 1986). By rewarding completion of simple tasks not only with praise but with money motivation may be improved. The actual process of completing specific tasks may also strengthen basic cognitive functions and lead to more generalised improvements in performance which, in turn, could enhance overall quality of life.

Why it is important to do this review

The literature concerning the efficacy of financial rewards as a motivating force for people with schizophrenia is conflicting. Some research suggests that monetary incentives alone may improve motivation to perform (Summerfelt 1991). Others, however, have found improvement only when monetary reward is coupled with detailed instruction of the task (Green 1992). Efficacy of monetary rewards can also be affected by other factors such as differences in the amount of reinforcement used between studies, use of praise as well as reward, the type of environment participants are in and degree of illness. There is no clear evidence addressing these issues. An accompanying review on token economy for schizophrenia is maintained on the Cochrane Library (McMonagle 2000). However, we know of no systematically conducted reviews of monetary incentives, and considering the prevalence of financial support of unwell and disabled people with schizophrenia, it would seem relevant to summarise any evidence from trials.

OBJECTIVES

To review the effects of positive and/or negative monetary reinforcement for people with schizophrenia or schizophrenia-like illness.

METHODS

Criteria for considering studies for this review

Types of studies

All relevant randomised controlled trials. We excluded quasi-randomised trials, such as those where allocation is undertaken on surname. If a trial was described as double-blind, but it was implied it had been randomised, we included these trials in a sensitivity analysis.

Randomised cross-over studies will be eligible but only data up to the point of first cross-over because of the instability of the problem behaviours and the likely carry-over effects of all treatments

Types of participants

People with schizophrenia or similar chronic mental illnesses, diagnosed by any criteria, irrespective of gender, age or race.

Types of interventions

1. Fixed monetary reward: standard care plus an additional fixed monetary reward given if a prespecified behaviour is achieved or task completed.

2. Variable monetary reward: standard care plus additional variable levels of monetary reward given if a prespecified behaviour is achieved or task completed.
3. No monetary reward: standard care plus no reward given if a prespecified behaviour is achieved or task completed.
4. Standard care: the psychiatric care and medication normally given in the area where the trial is taking place (including any financial support or benefits normally received)

Types of outcome measures

We divided outcomes into short term (less than three months) medium term (three to six months) and long term (over six months).

Primary outcomes

1. General functioning
1.1 No important improvement in general functioning - short and medium term.

Secondary outcomes

1. Target behaviours
1.1 Continuation of target behaviour
1.2 Relapse of target behaviour
1.3 Clinically significant changes in target behaviours as defined by the study
1.4 Degree of change in target behaviour
2. Changes in behaviour other than target behaviour
2.1 Continuation of behaviour other than target behaviour
2.2 Relapse of behaviour other than target behaviour
2.3 Clinically significant changes in behaviour other than target behaviour
2.4 Degree of change in behaviour other than target behaviour
3. Adverse effects
3.1 Death - stratified by suicide or other
3.2 Leaving the study
3.3 Aggression/violence
4. Mental state
4.1 Relapse
4.2 Clinically significant change in mental state
4.3 Degree of change in mental state
5. Service utilisation
5.1 Discharge from hospital
5.2 Change in hospital status, for example change from locked to open ward
5.3 Change in requirement for medication
6. Satisfaction with care - patients, professionals or carers
6.1 Satisfied/not satisfied
6.2 Significant change in satisfaction
6.3 Degree of change in satisfaction
7. Economic outcomes
7.1 Cost due to treatment
7.2 Savings due to treatment.

Search methods for identification of studies

Electronic searches

1. The Cochrane Schizophrenia Group Trials Register (June 2008)
We used the phrase:
[(*token* or *reward* or *punish* or *milieu* or *reinforce* or *operant* or *contingen* or *modific*) in Title, Abstract and in REFERENCE and (*token* or *reward* or *punish* or *milieu* or *reinforce* or *operant*) in Intervention field in STUDY]
[(*monetary* or *financial* or *money* or *payment* or *contingency management*) in Title, Abstract, and Keyword in REFERENCE and (*monetary*) in Intervention field in STUDY]
This register is compiled by systematic searches of major databases, hand searches and conference proceedings (see Group Module).

Searching other resources

We also searched reference lists of included and excluded studies for additional relevant trials.

Data collection and analysis

Selection of studies

Authors AM and RM independently inspected citations identified from the search. We identified potentially relevant reports and ordered full papers for reassessment. This process was repeated for the full papers. If it was impossible to resolve disagreements these studies were added to those awaiting assessment and the authors of the papers contacted for clarification.

Data extraction and management

1. Data extraction
Authors AM and RM independently extracted data from included studies. Again, any disagreement was discussed, decisions documented and, if necessary, authors of studies were contacted for clarification.
2. Management
Data were extracted onto standard, simple forms. Where possible, data were entered into RevMan in such a way that the area to the left of the 'line of no effect' indicates a 'favourable outcome' for monetary reward. Where this was not possible, for example for scales that calculate higher scores=improvement, graphs in RevMan were labelled accordingly so that the direction of effects were clear.

3. Scale-derived data

A wide range of instruments are available to measure outcomes in mental health studies. These instruments vary in quality and many are not validated, or are even ad hoc. We included continuous data from rating scales only if the measuring instrument had been described in a peer-reviewed journal (Marshall 2000) and the instrument is either a self-report or completed by an independent rater or relative (not the therapist).

Assessment of risk of bias in included studies

Again working independently, RM and AM assessed risk of bias using the tool described in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2008).This set of criteria is based on evidence of associations between overestimate of effect and high risk of bias of the article such as sequence generation, allocation concealment, blinding, incomplete outcome data and selective reporting.

The categories are defined below:

YES - low risk of bias

NO - high risk of bias

UNCLEAR - uncertain risk of bias

If sequence generation process within the trial was by quasi-random means, such as by odd or hospital record numbers, this was noted and the study was given a "NO - high risk of bias" rating. If data from such studies did not differ from the results of higher grade trials, these were presented. If disputes arose as to which category a trial had to be allocated, again, resolution was made by discussion, after working with the Cochrane Schizophrenia Group's Co-ordinating Editor (CEA).

Measures of treatment effect

1. Binary data

The review uses relative risk (RR) and its 95% confidence interval (CI) based on the random-effects model, as this takes into account any differences between studies even if heterogeneity is not statistically significant, as the preferred statistic for summation. Relative Risk is more intuitive (Boissel 1999) than odds ratios and odds ratios tend to be interpreted as RR by clinicians (Deeks 2000). This misinterpretation then leads to an overestimate of the impression of the effect. Data were inspected to see if analysis using a Mantel-Haenszel odds ratio and fixed-effect model made any substantive difference. For statistically significant results we calculated the number needed to treat/harm statistic (NNT/H), and its 95% confidence interval (CI) using Visual Rx (http://www.nntonline.net/) taking account of the event rate in the control group.

Where possible, we attempted to convert outcome measures to binary data. This can be done by identifying cut-off points on rating scales and dividing participants accordingly into 'clinically improved' or 'not clinically improved'. It was generally assumed that if there had been a 50% reduction in a scale-derived score such as the Brief Psychiatric Rating Scale (BPRS, Overall 1962) or the Positive and Negative Syndrome Scale (Kay 1986), this could be considered as a clinically significant response (Leucht 2005, Leucht 2005a). It was recognised that for many people, especially those with chronic or severe illness, a less rigorous definition of important improvement (e.g. 25% on the BPRS) would be equally valid. If individual patient data were available, we used the 50% cut-off for the definition in the case of non-chronically ill people and 25% for those with chronic illness. If data based on these thresholds were not available, we used the primary cut-off presented by the original authors.

2. Continuous data

2.1 Rating scales

A wide range of instruments are available to measure mental health outcomes. These instruments vary in quality and many are not valid, or are even ad hoc. For outcome instruments some minimum standards have to be set. They were that: (i) the psychometric properties of the instrument should have been described in a peer-reviewed journal (Marshall 2000); and (ii) the instrument should either be: (a) a self report, or (b) completed by an independent rater or relative (not the therapist).

2.2 Summary statistic

For continuous outcomes we estimated a random-effects weighted mean difference (MD) between groups. We did not calculate effect size measures.

2.3 Endpoint versus change data

We preferred to use scale endpoint data, which typically cannot have negative values and is easier to interpret from a clinical point of view. Change data is more problematic and the rule described above does not hold for it. Where both endpoint and change were available for the same outcome the reviewers presented the former in preference.

2.4 Skewed data

Mental health continuous data is often not 'normally' distributed. To avoid the pitfall of applying parametric tests to non-parametric data the following standards were applied to all data before inclusion: (i) standard deviations and means were reported in the paper or were obtained from the authors; (ii) if the data were finite number zero, for example 0-100, when the standard deviation was multiplied by two, the result should be less than the mean, otherwise the mean is unlikely to be an appropriate measure of the centre of the distribution (Altman 1996); (iii) if a scale starts from a positive value (such as PANSS which can have values from 30 to 210) the calculation described above will be modified to take the scale starting point into account. In these cases skew is present if 2SD>(S-S min), where S is the mean score and S min is the minimum score. Endpoint scores on scales often have a finite start and end point and these rules can be applied.

When continuous data are presented on a scale which includes a possibility of negative values (such as change data), it is difficult to tell whether data are skewed or not. Skewed data from studies of less than 200 participants were entered in additional tables rather

than into an analysis. Skewed data pose less of a problem when looking at means if the sample size is large and were entered into syntheses.

Unit of analysis issues

1. Cluster trials

Studies increasingly employ 'cluster randomisation' (such as randomisation by clinician or practice) but analysis and pooling of clustered data poses problems. Firstly, authors often fail to account for intraclass correlation in clustered studies, leading to a 'unit of analysis' error (Divine 1992) whereby p values are spuriously low, confidence intervals unduly narrow and statistical significance overestimated. This can cause type I errors (Bland 1997, Gulliford 1999).

Where clustering is not accounted for in primary studies, we presented data in a table, with a (*) symbol to indicate the presence of a probable unit of analysis error. In subsequent versions of this review we will seek to contact first authors of studies to obtain intraclass correlation coefficients of their clustered data and to adjust for this by using accepted methods (Gulliford 1999). Where clustering had been incorporated into the analysis of primary studies, we present these data as if from a non-cluster randomised study, but adjusted for the clustering effect.

We have sought statistical advice and have been advised that the binary data as presented in a report should be divided by a 'design effect'. This is calculated using the mean number of participants per cluster (m) and the intraclass correlation coefficient (ICC) [Design effect = 1+(m-1)*ICC] (Donner 2002). If the ICC was not reported it was assumed to be 0.1 (Ukoumunne 1999).

If cluster studies has been appropriately analysed taking into account intraclass correlation coefficient and relevant data documented in the report, synthesis with other studies would have been possible using the generic inverse variance technique.

2. Cross-over trials

A major concern of cross-over trials is the carry-over effect. It occurs if an effect (e.g. pharmacological, physiological or psychological) of the treatment in the first phase is carried over to the second phase. As a consequence on entry to the second phase the participants can differ systematically from their initial state despite a wash-out phase. For the same reason cross-over trials are not appropriate if the condition of interest is unstable (Elbourne 2002). As both effects are very likely in schizophrenia, we will only use data of the first phase of cross-over studies.

3. Studies with multiple treatment groups

Where a study involved more than two treatment arms, if relevant, the additional treatment arms were presented in comparisons. Where the additional treatment arms were not relevant, these data were not reproduced.

Dealing with missing data

1. Overall loss of credibility

At some degree of loss to follow-up data must lose credibility (Xia 2007). We are forced to make a judgment where this is for the trials likely to be included in this review. Should more than 40% of data be unaccounted for by eight weeks we did not reproduce these data or use them within analyses.

2. Binary

Where attrition for a binary outcome is between 0 and 40%, and outcomes of these people are described, we included these data as reported. Where the outcomes of such people were not clearly described, we assumed the worst primary outcome, and rates of adverse effects similar to those who did continue to have their data recorded.

3. Continuous

In the case where attrition for a continuous outcome is between 0 and 40% and completer-only data were reported, we have reproduced these.

Assessment of heterogeneity

1. Clinical heterogeneity

We considered all included studies without any comparison to judge clinical heterogeneity.

2. Statistical

2.1 Visual inspection

We visually inspected graphs to investigate the possibility of statistical heterogeneity.

2.2 Employing the I-squared statistic

This provided an estimate of the percentage of inconsistency thought to be due to chance. I-squared estimate greater than or equal to 50% was interpreted as evidence of high levels of heterogeneity (Higgins 2003).

Assessment of reporting biases

Reporting biases arise when the dissemination of research findings is influenced by the nature and direction of results (Egger 1997). These are described in section 10.1 of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins 2008). We are aware that funnel plots may be useful in investigating reporting biases but are of limited power to detect small-study effects. We did not use funnel plots for outcomes where there were ten or fewer studies, or where all studies were of similar sizes. In other cases, where funnel plots were possible, we sought statistical advice in their interpretation.

Data synthesis

Where possible we employed a fixed-effect model for analyses. We understand that there is no closed argument for preference for use of fixed or random-effect models. The random-effects method incorporates an assumption that the different studies are estimating different, yet related, intervention effects. This does seem true to us, however, random-effects does put added weight onto the

smaller of the studies - those trials that are most vulnerable to bias. For this reason we favour using fixed-effect models employing random-effects only when investigating heterogeneity.

Subgroup analysis and investigation of heterogeneity

If data are clearly heterogeneous we checked that data are correctly extracted and entered and that we had made no 'unit of analysis' errors. If the high levels of heterogeneity remained we did not undertake a meta-analysis at this point for if there is considerable variation in results, and particularly if there is inconsistency in the direction of effect, it may be misleading to quote an average value for the intervention effect. We would have wanted to explore heterogeneity. We pre-specify no characteristics of studies that may be associated with heterogeneity except quality of trial method. If no clear association could be shown by sorting studies by quality of methods a random-effects meta-analysis was performed. Should another characteristic of the studies be highlighted by the investigation of heterogeneity, perhaps some clinical heterogeneity not hitherto predicted but plausible causes of heterogeneity, these post hoc reasons will be discussed and the data analysed and presented. However, should the heterogeneity be substantially unaffected by use of random-effects meta-analysis and no other reasons for the heterogeneity be clear, the final data were presented without a meta-analysis.

Sensitivity analysis

If necessary, we analysed the effect of including studies with high attrition rates in a sensitivity analysis. We aimed to include trials in a sensitivity analysis if they are described as 'double-blind' but only implied randomisation. If we found no substantive differences within primary outcome when these high attrition and 'implied randomisation' studies were added to the overall results, we included them in the final analysis. However, if there was a substantive difference we only used clearly randomised trials and those with attrition lower than 50%.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

For substantive descriptions of studies please see: Characteristics of included studies; Characteristics of excluded studies.

Results of the search

The search of the Cochrane register identified 150 records, inspection of the titles and abstracts reduced this list to 10 relevant studies. We obtained full copies of these studies for detailed inspection. One is included in this review, leaving nine excluded. Other searches of high-yield journals and references did not find any further studies.

Included studies

We included only one study, carried out over 40 years ago, with a total of 25 participants (Thorpe 1962).

1. Length of studies

Thorpe 1962 was 68 days long and consisted of three periods of cross-over in which after every two weeks the group's monetary incentives were reversed. We have used data only to the point of the first cross-over (14 days).

2. Setting

All included participants were hospitalised and their mean length of stay in hospital was approximately 20 years. These are likely to have been very seriously ill and damaged people.

3. Participants

All participants were chronically ill and diagnosed with schizophrenia using Arieti 1955 published criteria for schizophrenia. All were women over 36 years old with an average age of around 43 years. None of the participants were paranoid at the time of the study.

4. Study size

Thorpe 1962 had only 25 participants.

5. Interventions

5.1 Monetary reward

Monetary reward was provided after completion of a manual task (assembling plastic dolls, by inserting two arms and two legs into appropriate sockets in the body). The 25 participants were split into five groups. For the first arm of the trial two groups were told that they were to be paid for the number of dolls they were able to assemble as a group. For every twelve dolls assembled, the group received six [old] pence (current = £0.025) and this was divided evenly among group members.

5.2 No monetary reward

The other three groups were asked to complete the same manual task but received no monetary reward.

6. Outcomes

6.1 Limited data

This study only reported two outcomes. They reported how people did on the target behaviour - in this case doll assembly. There is also the outcome of leaving early.

6.2 Outcome scales

No outcome scales were used to collect data.

6.3 Missing outcomes

Thorpe 1962 did not address general functioning, mental state, adverse effects, economic outcomes, hospital outcomes, long-term efficacy and safety or satisfaction with care.

Excluded studies

We excluded nine studies. Mostly this was because the interventions did not fit our protocol criteria. In some cases monetary rewards were not the only incentive randomised, and in others the control intervention was not 'standard care' or 'no monetary reward' (five studies). The other four studies were excluded because they did not present any usable data.

Awaiting assessment

We have no studies awaiting assessment.

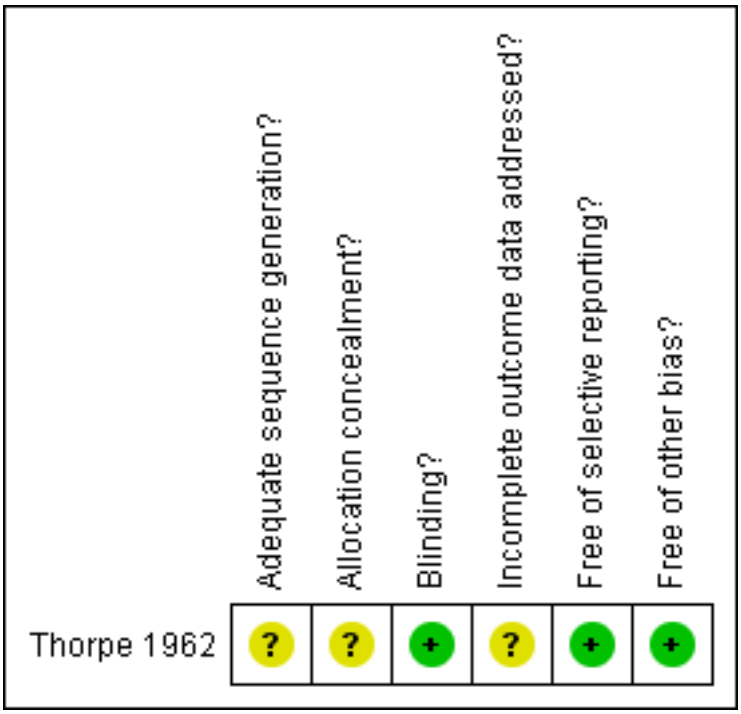
Ongoing studies

We found no ongoing studies.

Risk of bias in included studies

Our risk of bias judgements are illustrated in Figure 1.

Figure 1. Methodological quality summary: review authors' judgements about each methodological quality item for each included study.



Allocation

Participants were stated to be randomised but details of both sequence generation and allocation concealment are not available.

Blinding

It was not practical to blind participants in a trial such as this but it was unclear if those counting the outcome were blind to allocation. Nevertheless, as the outcome was quite concrete - number of assembled dolls - we have rated blinding as adequate.

Incomplete outcome data

We have no record of the original protocol and are not clear if all outcomes were reported.

Selective reporting

No selective reporting was seen.

Other potential sources of bias

It was not clear if there were other sources of bias in this trial but we do not have reasons to be overly concerned.

Effects of interventions

See: **Summary of findings for the main comparison** Monetary reward compared with no monetary reward for schizophrenia

1. COMPARISON 1. ADDITIONAL MONETARY REINFORCEMENT versus NO MONETARY REINFORCEMENT

1.1. Target behaviour: mean number of dolls assembled per day.

We identified one relevant trial (n=25, duration 14 days before first cross-over). This small, short study was undertaken in an institutional work-placement and groups of participants were given six pence per dozen dolls assembled. People allocated to the payment group produced less dolls than those not paid at all but not to a conventional level of statistical significance (1 RCT, n=25, MD -0.80 CI -1.44 to -0.16).

1.2. Leaving the study early

Again, data are limited. We have assumed there was no loss from either group from interpretation of the data presented in graphs.

DISCUSSION

Summary of main results

1. Few data

Perhaps the most important thing in this review is that some researchers have been interested in this topic. Five trials in the currently excluded studies are of related comparisons and it should be possible to include them in an update. Our protocol, which we have followed, was not focused on these other comparisons and we therefore have only one study in this version of the review. However, at least six studies have been undertaken indicating that our interest in this question is not unique.

2. COMPARISON 1. ADDITIONAL MONETARY REINFORCEMENT versus NO MONETARY REINFORCEMENT

2.1 Target behaviour

Overall results showed people offered monetary reward produced fewer dolls than those not receiving monetary reward although this was not to a statistically significant extent. It is difficult to judge the findings of this 1962 trial from the perspective of over four decades later. People in this study seem to have had the most severely intractable illnesses and had spent decades in hospital institutions. It is possible that the monetary reinforcement used was felt to be insultingly small, or that it did not represent money at all, but rather a token to be used within an institutional economy. In any event, data are so limited, that any extrapolation of them to the present would be inadvisable. The question regarding monetary reinforcement versus standard care certainly remains open.

2.2 Leaving the study early

We are unsure if these people were free to leave the study and this finding too should be not considered informative in any way.

Overall completeness and applicability of evidence

Considering that monetary incentive was, for a period, an intervention of interest, with firm roots in experimental psychology, it is surprising that more evaluations within randomised trials do not exist. The total number of people randomised to the study relevant to this review is 25. Such a small pool of data is unlikely to ever produce results that are meaningful for clinical care. Furthermore the length of the trial was short and given the chronic nature of schizophrenia, a much longer period of evaluation is necessary. The trial also did not evaluate whether effects were maintained beyond the monetary reinforcement environment. Finally a small specific group of participants were randomised - only non-paranoid chronically ill women were employed in the task. The evidence may have been more influential if the trial had been conducted using both sexes, a larger sample size and with people not selected to be free of paranoid beliefs.

Quality of the evidence

For details of methodological quality of the included trial see Characteristics of included studies and Figure 1. The quality was judged to be moderate although it is difficult to judge trials carried out a long time ago by the standard of today (Begg 1996, Moher 2001). Certainly, any trial designed today should be of much higher quality and report both methods and outcomes more clearly.

Potential biases in the review process

We attempted to avoid as many biases as we could. However, we could have failed to identify studies or experiments. The use of monetary rewards is just the type of experiment that could have been undertaken as part of a doctoral or masters theses now forgotten. We think, however, that we should have identified any large studies.

Agreements and disagreements with other studies or reviews

The nearest review to this is the Cochrane review of token economy (McMonagle 2000). This review, also summarising small studies from a system of care now not prevalent in at least high-income countries, does suggest that there may be some benefit for use of tokens in a restricted - and rather institutionalised - economy. Our review does not contradict this but just contains too few data

to be informative, excepting only the fact that monetary rewards has been possible to be evaluated within a randomised trial. This review agrees with the conclusion of McMonagle 2000 in that we also feel that randomised trials are possible in this area and should be undertaken.

AUTHORS' CONCLUSIONS

Implications for practice

1. For people with schizophrenia

Overall, there is no convincing evidence that monetary incentives have an effect - either positive or negative - for those suffering from severe mental illness. Financial support for activity usually is motivating but this is not illustrated from the study included in this review. It may be that modest reward could do much good and volunteering to be involved in studies may help clarify the issue. It would be important that the trials are of a high methodological quality and seek meaningful outcomes.

2. For clinicians

Based on current evidence there is no reason for clinicians to either encourage or discourage the use of monetary incentives for activity in a way that respects the rights of all involved.

3. For policy makers

This review provides no evidence to support change in policy. People with schizophrenia need money to live. Whether money could be used as a therapeutic tool is possible, has been the focus of studies but these are not relevant today and should be undertaken.

Implications for research

1. General

In the case of trials in this area as well as others, researchers should report data in a clear way to enable clinical decision-making, ideally including intention-to-treat analyses on all outcomes. When data are presented, they should be presented as numbers rather than as percentages and continuous data should be reported with means, standard deviations (or standard errors) and the number of participants. Both editors and authors of trials should ensure strict adherence to CONSORT reporting guidelines (Moher 2001).

2. Specific

We think that this remains an active question of interest. Of course it would be difficult to evaluate but we think well worth doing. Modest additional financial reward may greatly encourage behaviours. There are few reviews that suggest that anything can be done with the difficult 'negative' symptoms of schizophrenia. The Cochrane review of token economy (McMonagle 2000) did have some data to suggest that tokens given within an economy where tokens are used could be of help. Such institutional token economies are not prevalent - at least officially - and money may be a better way of achieving gain. We also realise that suggesting a design here is not giving it the careful consideration that it needs but we have learnt some things from the studies we have inspected and suggest one study design in Table 1.

ACKNOWLEDGEMENTS

We acknowledge adaptation of the text of the 'Methods' section of this review. The Cochrane Schizophrenia Group has evolved generic text that we have used and changed to make it relevant to this review. We would like to thank the Editorial base of the Cochrane Schizophrenia Group.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Thorpe 1962

Methods	Allocation: randomised, no further details. Blindness: unclear, not stated. Duration: six week cross over trial - divided into three arms of two week sessions* Raters: ward sisters used as raters.
Participants	Diagnosis: schizophrenia (Arieti 1955 2nd or 3rd stage). N=25. Age: mean ~ 43 years, range 36 to 50 years. Sex: all female. Setting: hospital. History: chronic, non-paranoid, mean time in hospital ~ 20 years, half of the participants had pre-frontal leucotomomy not less than four years previously
Interventions	1. Monetary reward: One hour session in the morning assembling plastic dolls, task required considerable manual dexterity, inserting two arms and two legs into appropriate sockets of doll's body. Session repeated for an hour in the afternoon. Paid 3 pence/12 dolls assembled. N=10 2. No monetary reward: Same work assembling dolls with no monetary reward. N=15
Outcomes	Target behaviour: average number of dolls produced per day.** Leaving the study early***
Notes	* Only data from first two week arm of trial used as data after first cross-over prone to bias. ** All data retrieved from graphs alone. *** Assumed no loss

Risk of bias

Item	Authors' judgement	Description
Adequate sequence generation?	Unclear	No description: "the twenty-five patients were split into five groups of five by a random-selection technique"
Allocation concealment?	Unclear	No description: "these groups were numbered one to five and patients within each group worked together in a small circle"
Blinding? All outcomes	Yes	Not practical to blind participants to treatment, unclear if raters blind to allocation: "patients in groups 1 and 4 were informed that they would be working for money and paid according to how many dolls they were

Thorpe 1962 (*Continued*)

		able to assemble as a group. Patients in groups 1,2, and 5 were informed that they would be assembling dolls but would not receive any payment"
Incomplete outcome data addressed? All outcomes	Unclear	No description.
Free of selective reporting?	Yes	All outcomes reported.
Free of other bias?	Yes	No description of author affiliations given, but thought other biases unlikely

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Dilling 1971	Allocation: unclear. Participants: people with schizophrenia. Interventions: various schedules of payment for work. Outcomes: performance, staff assessment, no numerical data.
Hellman 1998	Allocation: random. Participants: people with schizophrenia. Interventions: low (2 cents per correct response) and high (10 cents per correct response) monetary reinforcement and instruction. Outcomes: performance, no useable numerical data.
LaPorte 1997	Allocation: random. Participants: people with schizophrenia. Interventions: two levels of monetary positive or negative reinforcement. Outcome: performance, no numerical data.
Nugent-Hirschbeck 1995	Allocation: random. Participants: people with schizophrenia. Interventions: monetary reward + memory enhancement vs monetary reward. Investigating effect of memory enhancement not monetary reward has on performance
Olfson 1998	Allocation: random. Participants: men with long-standing schizophrenia. Interventions: social reward plus monetary coupons vs no social or monetary coupons, not money alone
Phillips 1964	Allocation: random. Participants: people with long-standing schizophrenia Interventions: monetary reward frequencies for work therapy tasks. Outcomes: work output, no numerical data.

(*Continued*)

Ravensborg 1972	Allocation: random. Participants: men with long-standing schizophrenia. Interventions: praise reinforcement alone vs praise and money reinforcement, not money alone. Outcomes: Interpersonal awareness development and increased ward behaviour
Summerfelt 1991	Allocation: random. Participants: people with schizophrenia. Interventions: monetary reward versus no monetary reward. Outcomes: no usable data.
Wexler 1997	Allocation: random. Participants: people with long-standing schizophrenia. Interventions: various task difficulties, paid everyone, not allocating monetary rewards

DATA AND ANALYSES

Comparison 1. MONETARY REWARD vs NO MONETARY REWARD

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Target behaviour: average number of dolls assembled per day	1	25	Mean Difference (IV, Fixed, 95% CI)	-0.80 [-1.41, -0.19]
2 Leaving the study early	1	25	Risk Difference (M-H, Fixed, 95% CI)	Not estimable

Analysis 1.1. Comparison 1 MONETARY REWARD vs NO MONETARY REWARD, Outcome 1 Target behaviour: average number of dolls assembled per day.

Review: Monetary incentives for schizophrenia

Comparison: 1 MONETARY REWARD vs NO MONETARY REWARD

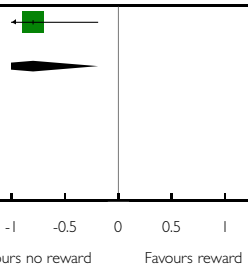
Outcome: 1 Target behaviour: average number of dolls assembled per day

Study or subgroup	Monetary reward		No monetary reward		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	IV,Fixed,95% CI		IV,Fixed,95% CI
Thorpe 1962	10	1.87 (0.68)	15	2.67 (0.88)		100.0 %	-0.80 [-1.41, -0.19]
Total (95% CI)	**10**		**15**			**100.0 %**	**-0.80 [-1.41, -0.19]**

Heterogeneity: not applicable

Test for overall effect: Z = 2.56 (P = 0.011)

Test for subgroup differences: Not applicable

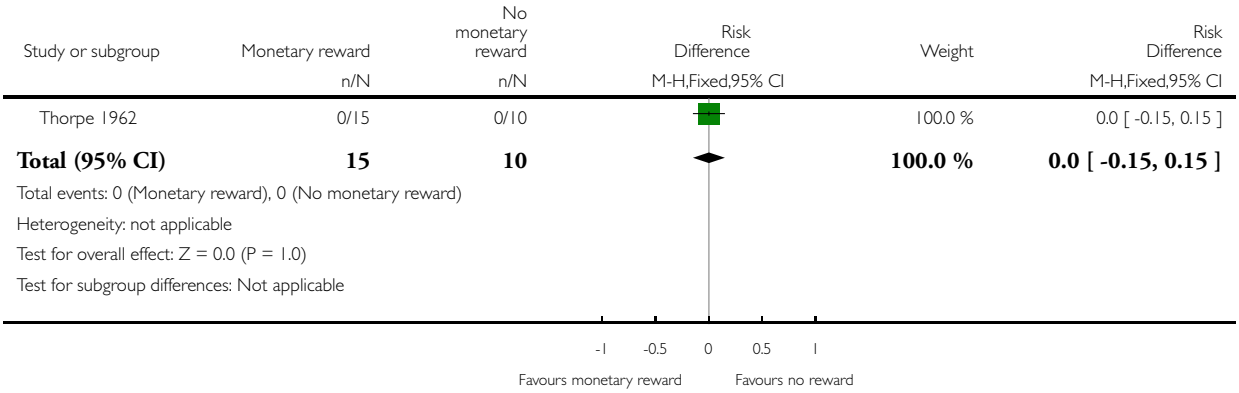


Analysis 1.2. Comparison 1 MONETARY REWARD vs NO MONETARY REWARD, Outcome 2 Leaving the study early.

Review: Monetary incentives for schizophrenia

Comparison: 1 MONETARY REWARD vs NO MONETARY REWARD

Outcome: 2 Leaving the study early



ADDITIONAL TABLES

Table 1. Suggested design of study

Methods	Allocation: randomised, clearly described. Design: cross-over.* Duration: 3 months before first cross-over.
Participants	Diagnosis: schizophrenia. N=300.** Age: any. Sex: men and women. History: stable, perhaps with prominent negative symptoms, perhaps attending day units
Interventions	1. Additional funds: not given every day but intermittently and randomly*** as reward for countering person-specific negative symptom. N=150 2. No additional funds. N=150.
Outcomes	Target symptoms: improved/not improved to important extent. Satisfaction. Quality of life. Functioning.

Table 1. Suggested design of study (*Continued*)

Notes	* in suggesting cross-over design we are attempting to ensure that everyone is assured of reward. ** study size to clearly illustrate 20% difference between groups in binary outcome. *** strong positive reinforcer

WHAT'S NEW

Last assessed as up-to-date: 5 August 2008.

Date	Event	Description
11 November 2009	Amended	Contact details updated.

HISTORY

Protocol first published: Issue 1, 2009

Review first published: Issue 4, 2009

CONTRIBUTIONS OF AUTHORS

Amy Mitchell - instigated the review, wrote the protocol, extracted data, wrote review.

Rosanna Michalczuk - instigated the review, wrote the protocol, extracted data, wrote review.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- University of Nottingham, UK.

External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Some sections of the protocol are updated to reflect the new format of Cochrane Schizophrenia Group reviews. We do not feel that the update of the protocol threatens validity of the review.

INDEX TERMS

Medical Subject Headings (MeSH)

*Motivation; *Reward; *Schizophrenic Psychology; Schizophrenia [economics; *rehabilitation]

MeSH check words

Humans