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Kimberly C. Kirby
Rowan University

Lois A Benishek

Mary B Tabit

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Contingency management works, clients like it, and it is cost-effective

Kimberly C. Kirby, PhD, BCBA-D^{1,2,3}, Lois A. Benishek, PhD^{2,3}, and Mary B. Tabit, PsyD²

¹Department of Psychology, Rowan University, Glassboro, NJ USA

²Treatment Research Institute, Philadelphia, PA USA

³University of Pennsylvania, Philadelphia, PA USA

Contingency management (CM) programs that arrange reinforcement of biologically-verified abstinence are among the most powerful treatments for a wide range of substance use disorders (Castells et al., 2009; Lussier et al., 2006; Prendergast et al., 2006). Nevertheless, these programs are underutilized despite solid scientific support for their ability to produce clinically meaningful reductions in substance use (e.g., Benishek et al., 2010). To better understand this trend, a considerable amount of research (McGovern et al., 2004; Rash et al., 2012; Willenbring et al., 2004), including our own (Kirby et al., 2006; Benishek et al., 2010; Kirby et al., 2012), has focused on evaluating treatment providers' utilization and opinion of CM approaches. Two articles in this issue of *American Journal of Drug and Alcohol Abuse (AJDAA)* further the important discussion regarding the implementation of CM in community substance abuse treatment settings: Hartzler and Garrett (2016) examine client preferences regarding programmatic aspects of CM, and López-Núñez et al. (2016) address its cost-effectiveness, concluding that CM substantially increases smoking abstinence and that investing small additional amounts of money can result in greater benefits.

The Hartzler and Garrett article encourages us to consider clients' perceptions about incentives and two key variables in reinforcement-based interventions, such as CM: reinforcement schedule (fixed vs variable) and reinforcement delay. They found that clients prefer a predictable fixed schedule, where a reinforcer is delivered every time substance abstinence is biologically verified, as opposed to a variable schedule where abstinence may not be rewarded each time. This finding has implications for the fishbowl procedure developed by Petry and her colleagues (e.g., Petry et al., 2000; Peirce et al., 2006). The fishbowl procedure allows clients to draw slips of paper from a bowl; half which indicate the person has won a prize of varying size ("small," "large," "jumbo") and half indicating no reward at all ("try again"). This produces a variable schedule of reinforcement that does not allow clients to predict how much they will earn. In contrast, the escalating schedule developed by Higgins and his colleagues (Higgins et al., 1991) results in payment each time abstinence is verified. Like fixed schedules of reinforcement, the escalating schedule

delivers a reinforcer (i.e., voucher) every time the desired behavior occurs, but the magnitude varies in a predictable way. For example, each time the client demonstrates continued abstinence by submitting another consecutive sample that tests negative for a substance, the reinforcer increases by a fixed amount (e.g., \$1.25). In this way, the longer the client maintains abstinence, the greater the value of the voucher. Based on Hartzler and Garrett's findings, we might predict that clients would prefer the escalating schedule, but additional studies that actually expose clients to the two schedules and ask them to select one (as opposed to asking a hypothetical question) is needed to fully understand their preferences for schedules of reinforcement that have been empirically established as efficacious.

With respect to reinforcement delay, Hartzler and Garrett report that clients prefer distal distribution of earned incentives; that is, they would rather save up points earned during CM and exchange them later than be required to accept a cash reward immediately. They comment that this is in contrast to the well-established guidelines that indicate that immediate delivery of reinforcement is more effective than delayed reinforcement for shaping client behavior. Although the immediate impression is that clients' preferences are in conflict with guidelines for using reinforcement effectively, this is not necessarily so. Hartzler and Garrett's survey question asked "If you were able to earn vouchers would you rather...earn \$5 per week for 10 weeks or save weekly points for 10 weeks to earn \$50." This question seems to imply that the point vouchers are given immediately – it is the exchange that is delayed. Vouchers constitute a token economy, and it has long been known that in token economies, the token (voucher) becomes a conditioned reinforcer that "bridges the delay between the target response and backup reinforcement" (Kazdin & Bootzin, 1972). For some individuals (e.g., those with limited verbal capacity or who have "difficulty trusting"), more immediate exchanges may be needed; but as Kazdin and Bootzin noted in their seminal review, instruction is typically sufficient. Hartzler and Garrett's data are consistent with this observation, but again, studies that expose clients to different delay options and then ask them to select one (as opposed to asking a hypothetical question) are needed to better understand real-world applicability.

Hartzler and Garrett's discussion reminds us that there is a complicated interplay between reinforcer parameters (e.g., schedule, delay, type, magnitude) and the behavior being reinforced that has not been fully explored (cf. Beeby & White, 2013; Kyonka, 2008). Basic research generally upholds the concatenated generalized matching law (Davison & McCarthy, 1988) which assumes the effects of schedule, delay and other reinforcer parameters are additive and independent with no complicated interaction effects (Kyonka, 2008). However, some experts in the field of behavioral economics argue that reinforcer parameters do, in fact, interact and combine to affect behavior (e.g., Beeby & White, 2013). Clearly, more discussion and inquiry into this potential interplay between reinforcement parameters and behavior is warranted in the human and non-human animal research fields.¹

Finally, Hartzler and Garrett's findings suggest that, at least for the parameters of reinforcement schedule and delay (of token exchange), client preferences do not conflict

¹M. Ennis Soreth, personal communication, November 18, 2015.

with the science underlying well-established guidelines for effective contingency management. However, the study raises the following question: If future studies find some client preferences that are in conflict with guidelines for the effective use of CM, should we accommodate them? Perhaps some parameters of CM should not be negotiable, because modifying them would render the treatment ineffective. In other areas of medicine, we might allow patients a choice between different treatments or even no treatment. However, patients are not invited to choose options that are costly and ineffective. Drawing from these illustrations, a more important question might be: What types of client preferences can be accommodated without compromising the cost-effectiveness of CM?

This brings us to López-Núñez and her colleagues' study in this issue of *AJDA* which addresses the cost-effectiveness of a particular CM intervention by examining the costs and smoking cessation outcomes of a cognitive-behavioral treatment (CBT) alone relative to the same CBT treatment with CM added (CMT+CM). Their original efficacy study (Secades-Villa et al., 2014) found abstinence rates at 6 months were nearly twice as high for individuals randomly assigned to the CBT+CM condition (51.2%) compared to individuals assigned to the CBT-only condition (28.6%; $p=.045$). CBT+CM also produced longer durations of continuous abstinence (11.95 weeks vs. 6.89 weeks; $p=.058$) at follow-up, and statistically significant end-of-treatment group differences in the number of cotinine-free specimens (3.79 vs. 2.29; $p=.003$). In their present analysis, López-Núñez et al. report that the cost of adding CM to increase the longest duration of continuous abstinence by 1 week was €53.92 (US\$ 58.39) and that the cost to increase the number of participants maintaining abstinence at 6 months by 1 participant was €68.22 (US\$ 73.88).

One of the challenges of cost-effectiveness studies is that they can appear complicated, technical, and difficult for policy-makers and other outsiders to interpret. For example, López-Núñez et al. report that it costs nearly €54 (US\$ 59) for one more week of smoking abstinence, but do not specify if this is the amount per participant (presumably it is as other values are stated per participant; see Table 3). We wonder whether these results would be compelling to most policy-makers. How many added weeks of abstinence would be needed to be clinically meaningful; that is, to improve a client's quality of life or reduce health complications due to smoking? It may be more helpful for decision-makers to know that as the cost of CM increases the net benefits of CM increase disproportionately. While this information is possibly more compelling, policy-makers may still be left wondering who realizes these benefits and exactly how are they expressed. Despite these communication challenges, the message is clear that CM substantially increases smoking abstinence and that investing small additional amounts of money can result in greater benefits. Perhaps the simplest and most compelling to policy-makers is the comparison López-Núñez et al. draw between these results with those of previous studies, where the incremental cost per quitter of adding CM to CBT was US\$ 281.00 compared to other pharmacological and computer-based interventions ranging in cost from £222 (US\$ 345.66) to US\$ 3,781.

The findings of López-Núñez et al. and similar types of analyses have significant policy implications for treatment administrators as well as state and federal policy makers. As the authors note, these cost-effectiveness analyses can be used as a decision-making tool to determine how best to allocate limited financial resources to evidence-based interventions

aimed at improving health functioning and to estimate how much clinical “return” can be expected based on the money invested. A question that may emerge from these analyses is whether stigma interferes with payers’ (e.g., managed care) willingness to fund similar programs for other substances of abuse (e.g., opioids, cocaine). Within this realm, it may be worthwhile for future researchers to survey payers’ beliefs related to what these organizations are willing to invest in CM to obtain these expected returns.

Considering López-Núñez et al.’s impressive findings in terms of both affordability and effectiveness utilizing a CBT+CM approach for smoking cessation, one question that emerges (and needs to be assessed in future studies) is whether findings of this cost-evaluation will hold across different settings, diverse populations, different substances of abuse, and/or different schedules of reinforcement. Demonstrating that these findings support the use of CM, while continuing to demonstrate the same “return,” will be critical in further convincing payers to invest in adding CM to existing treatment programs. Consideration should also be given to expected treatment duration, in that it is likely that this may vary by substance use severity and possibly by substance of abuse.

López-Núñez et al.’s secondary analysis is consistent with previous research demonstrating that CM is efficacious in increasing smoking abstinence and adds to a growing body of literature demonstrating cost-effectiveness of CM interventions. Hartzler and Garrett’s work encourages us to consider client preferences when formulating and implementing CM procedures, which may facilitate greater client investment in treatment and positively impact motivation for change. In considering both studies, although modifying CM to match client preferences may result in highly individualized interventions and further complicate our ability to determine CM’s cost-effectiveness per participant, it is our hope that future research on CM procedures will yield results that will allow treatment providers to adopt a more client-centered approach while maintaining its cost-effectiveness and will encourage payers to allocate funding for CM.

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