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Considerations for remote delivery of behavioral economic interventions for substance use disorder during COVID-19 and beyond



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ABSTRACT

The response to the COVID-19 crisis has created direct pressure on health care providers to deliver virtual care, and has created the opportunity to develop innovations in remote treatment for people with substance use disorders. Remote treatments provide an intervention delivery framework that capitalizes on technological innovations in remote monitoring of behaviors and can efficiently use information collected from people and their environment to provide personalized treatments as needed. Interventions informed by behavioral economic theories can help to harness the largely untapped potential of virtual care in substance use treatment. Behavioral economic treatments, such as contingency management, the substance-free activity session, and episodic future thinking, are positioned to leverage remote monitoring of substance use and to use personalized medicine frameworks to deliver remote interventions in the COVID-19 era and beyond.

1. Introduction

The rapid ramp-up of virtual care to reduce COVID-19 transmission has reduced long-standing barriers to remote treatment for substance use disorders (SUDs; Knopf, 2020; Benavides-Vaello, Strode, & Sheeran, 2013; Huskamp et al., 2018). For SUD patients who have increased vulnerability to COVID-19 (Volkow, 2020) and experience barriers to treatment (e.g., transportation, scheduling), the relaxed regulations (Lin, Fernandez, & Bonar, 2020) and recommendations promoting reduced disease transmission (Farhoudian, Baldacchino, & Clark, 2020) may increase engagement and treatment access. Changing trends suggest that providers and health systems were interested in enhancing virtual care options (Cordasco et al., 2019; Ferreri, Bourla, Mouchabac, & Karila, 2018; Molfenter, Boyle, Holloway, & Zwick, 2015) even before COVID-19. Some, including ourselves, hope that decreased barriers and increased reimbursement for remote services will continue beyond the pandemic. This change may revolutionize outpatient SUD care and bring remote treatment, particularly, into the mainstream (Lin et al., 2020).

COVID-19 has prompted an opportunity to capitalize on the momentum of virtual care to pursue treatments that not only *can* be delivered remotely but are especially well-suited to this modality. The recent rapid expansion of virtual care has outpaced scientific research on the optimal delivery of remote SUD interventions. Nonetheless,

remote treatments are necessary during COVID-19, and these treatments can benefit from technological innovations in remote monitoring of behaviors and efficient use of information collected from people and their environment (Nahum-Shani et al., 2018).

2. Behavioral economic interventions are well-suited for virtual care during and after COVID-19

Although some well-supported remote psychosocial interventions exist (Carroll et al., 2008; Copeland & Martin, 2004), in the COVID-19 context and beyond, interventions informed by behavioral economic theories may harness the largely untapped potential of virtual care in SUD treatment. Reinforcer pathology, a behavioral economic model of substance misuse, proposes that SUDs are characterized by overvaluing substances, undervaluing their associated risks/consequences, and devaluing alternative behaviors (e.g., family time) and positive consequences of abstaining (e.g., health; Bickel et al., 2016; Bickel, Johnson, Koffarnus, MacKillop, & Murphy, 2014). Reinforcer pathology is measured through distinct but intersecting processes: excessive demand (persistently high valuation of a reinforcer such as a drug), and excessive delay discounting (extreme preference for immediate reinforcement despite future negative consequences). Evidence strongly supports that these processes undergird the development, maintenance, and recovery process for SUDs (Athamneh et al., 2019; Audrain-

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Table 1

State of empirical support, rationale for remote delivery, and special considerations during the pandemic for each behavioral economic intervention.

Intervention	State of the evidence	Benefits of remote delivery	COVID-19 considerations
Contingency Management (CM): Reinforces a goal behavior (e.g., abstinence) by providing rewards, such as gift cards, prizes, or money, based on an incentive schedule (e.g., \$10 for a negative urine sample)	Support from numerous randomized clinical trials across SUDs	Recent and ongoing development of remote monitoring technologies permit abstinence verification without in-office visits reducing barriers to implementation	Incentive schedules may be most effective if they account for increased slips due to a spectrum of increased stressors during the pandemic Funding for incentives remains a concern, particularly as healthcare systems are losing money during COVID-19
Substance Free Activity Session (SFAS): Delivered in conjunction with a brief motivational intervention, the SFAS emphasizes how substance-free activities (e.g., attending class/work) support achieving long-term goals, including discussing the congruence between time-allocation to substance-using and substance-free activities with future goal attainment	Support from a few randomized clinical trials for alcohol use	Increased potential for dissemination when combined with empirically-supported motivational interventions Additional substance-free activities may be identified by leveraging web access to provide users with menus of local activities (including dates/times, costs, locations) Remote reminders and check-ins about substance-free activities, and tracking of time spent on these target activities, may amplify intervention effects	Some substance-free activities may be unavailable due to the pandemic, while others may be available virtually or in alternative settings (e.g., outside)
Episodic Future Thinking (EFT): Develops personally-relevant substance-free events at future timepoints (e.g., 1 month, 1 year) which are described in great detail to increase the vividness of the future thought, making the event more tangible. Each event is summarized as a brief cue/statement that can be used as reminders of the events.	Initial support predominantly from experimental studies for alcohol and nicotine use	Cues developed during the EFT intervention can be delivered remotely as reminders of positive, substance-free events to reduce in-the-moment substance misuse	Increased uncertainty about the future may make EFT generation more challenging; however, EFT cues may prove especially critical to offset myopic focus

McGovern et al., 2009; Bickel et al., 2014; Bickel, Quisenberry, & Moody, 2015; González-Roz, Secades-Villa, Martínez-Loredo, & Fernández-Hermida, 2020; Gray & MacKillop, 2015). Yet practitioners have implemented surprisingly few behavioral economic interventions in clinical settings (see Table 1).

Contingency management (CM) is an empirically supported treatment that increases the opportunity cost of substance use by reinforcing alternative behaviors (e.g., treatment engagement, medication adherence, abstinence). CM is as effective as gold-standard SUD treatments (e.g., cognitive-behavioral therapy [CBT]). Frequent clinic visits, often multiple times weekly, for abstinence verification (De Crescenzo et al., 2018; Farronato, Dürsteler-Macfarland, Wiesbeck, & Petitjean, 2013) are barriers to implementation. Virtual delivery of CM using remote verification of substance use is under evaluation as a remotely delivered treatment for alcohol use (NCT03883126), with promising preliminary findings (Koffarnus, Kablinger, Swallow, & Bickel, 2015). Abstinence verification technologies for alcohol use include remote breath sensors (Keays, 2014; Ofir, Navon, Yichie, & Biron, 2014) and wearables (Fairbairn & Kang, 2019; Flango & Cheesman, 2009); and development is underway for wearables and remote sensors to detect cocaine (Holtyn et al., 2019), nicotine (Imtiaz, Ramos-Garcia, Wattal, Tiffany, & Sazonov, 2019; Tai et al., 2020), cannabis (Mishra et al., 2020), and simultaneous use of multiple substances (Xue et al., 2020). Research is necessary to: 1) support deploying CM into virtual care, including evaluating the feasibility and effectiveness of remotely delivered CM for a variety of SUDs, and 2) develop implementation strategies to embed remote CM into existing clinics sustainably. Given the necessity of remote care in COVID-19, opportunities may exist to examine remote CM in clinical case studies.

The substance-free activity session (SFAS), a supplement that practitioners provide with a motivational intervention that has efficacy in people who drink alcohol (Meshesha et al., 2020; Murphy et al., 2012, 2019), is a behavioral economic treatment with increasing empirical support. The SFAS targets behavioral economic mechanisms of increased future orientation and substance-free reinforcement by emphasizing how substance-free activities support the attainment of long-

term goals. Combined with a motivational intervention, the SFAS increases substance-free activities and related enjoyment (i.e., reinforcement) and decreases alcohol demand. With accumulating evidence that supports the efficacy of motivational interventions that could be delivered remotely (Blow et al., 2017; Gates, Norberg, Copeland, & Digiusto, 2012), adapting the SFAS to supplement motivational treatments may enhance effectiveness remotely. The COVID-19 pandemic provides a context for exploring these options. Further, an app-based SFAS could increase the variety and specificity of substance-free activities for individuals to engage in by pulling web-based resources, as is done in other interventions (Bauermeister et al., 2018). Such an app could provide real-time updates of dates and times (or cancellations/closures as relevant during COVID-19), locations, and registration links, increasing realistic activity selections, and decreasing barriers to engagement. Although COVID-19 has forced some substance-free activities (e.g., gyms) to be temporarily unavailable, similar activities remain accessible, in lower-risk spaces (e.g., outside) or virtually (e.g., workout classes). Researchers should conduct work to establish the acceptability and effectiveness of an app-based SFAS coupled with remote motivational interventions and establish its utility among individuals with SUDs who misuse substances other than alcohol.

Finally, episodic future thinking (EFT) is an intervention that targets the behavioral economic mechanism of delay discounting by increasing the individual's future orientation. During EFT interventions, individuals develop cues for personalized future events. These cues are especially well-suited for remote deployment (e.g., text message, app delivery) to provide event reminders, which increase the saliency and relative valuation of the future. This cueing may be especially important to examine during COVID-19 because people have had important events delayed or canceled. A therapist could assist in generating and elaborating on alternative future events. EFT improves behavioral economic mechanisms (delay discounting, demand) in human laboratory studies (Bulley & Gullo, 2017; Snider, LaConte, & Bickel, 2016; Stein et al., 2016). The next steps for research are establishing the feasibility, acceptability, and efficacy of remote EFT interventions. If research identifies in what contexts, at what frequency,

and at what times people are most receptive to EFT cues, researchers can develop remotely-delivered EFT interventions that are adaptive to real-world situations, including future pandemics or COVID-19 surges, to optimize effectiveness.

3. Conclusions

Behavioral economic interventions are positioned to leverage remote substance use monitoring and remote care technology to enhance the delivery of SUD care during COVID-19 and beyond. For example, using wearable devices to bioverify substance use can support remote CM. At the same time, practitioners may implement SFAS and EFT using a personalized medicine framework to provide intervention prompts as needed to people in the real world (e.g., walking by a bar, craving a drug). Critically, behavioral economic interventions may complement one another, with EFT predominantly targeting delay discounting and the SFAS shifting demand toward healthier behaviors. CM may facilitate proximal goals (e.g., initial abstinence); whereas, EFT may prove beneficial for distal outcomes by increasing future orientation. When combined, behavioral economic interventions may fortify each other, potentially enhancing the efficacy of each. However, rigorous efficacy trials are needed to study these interventions delivered alone and in conjunction with one another in real-world settings. Behavioral economic interventions may be preliminary treatments in a step-care model, or adjuncts to other evidence-based interventions, either delivered in person or remotely, such as CBT, motivational interventions, and medication-assisted treatments. Future work should determine which behavioral economic interventions work best in specific contexts and for specific people and how best to integrate behavioral economic interventions into the existing SUD treatment landscape. The recent expansion of remote care due to COVID-19 creates a context ripe for integration of newer remote approaches, and behavioral economic interventions specifically developed for remote delivery may reduce barriers to treatment and enhance the provision of evidence-based SUD care.

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Declaration of competing interest

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