Mobile Phone–Based Mood Ratings Prospectively Predict Psychotherapy Attendance

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Psychotherapy nonattendance is a costly and pervasive problem. While prior research has identified stable patient-level predictors of attendance, far less is known about dynamic (i.e., time-varying) factors. Identifying dynamic predictors can clarify how clinical states relate to psychotherapy attendance and inform effective "just-in-time" interventions to promote attendance. The present study examines whether daily mood, as measured by responses to automated mobile phone-based text messages, prospectively predicts attendance in group cognitive-behavioral therapy (CBT) for depression. Fifty-six Spanish-speaking Latino patients with elevated depressive symptoms (46 women, mean age = 50.92 years, SD = 10.90 years), enrolled in a manualized program of group CBT, received daily automated mood-monitoring text messages. Patients' daily mood ratings, message response rate, and delay in responding were recorded.

Patients' self-reported mood the day prior to a scheduled psychotherapy session significantly predicted attendance, even after controlling for patients' prior attendance history and age ($OR = 1.33$, 95% CI [1.04, 1.70], $p = .02$). Positive mood corresponded to a greater likelihood of attendance. Our results demonstrate the clinical utility of automated mood-monitoring text messages in predicting attendance. These results underscore the value of text messaging, and other mobile technologies, as adjuncts to psychotherapy. Future work should explore the use of such monitoring to guide interventions to increase attendance, and ultimately the efficacy of psychotherapy.

Keywords: text messaging; attendance; mHealth; psychotherapy; depression

NONATTENDANCE OF PSYCHOTHERAPY IS a pervasive problem—one that is linked to poor therapeutic outcomes (Mitchell & Selmes, 2007) and significant costs to clinics (Lefforge, Donohue, & Strada, 2007). Mobile phone–based short messaging service (i.e., SMS or "text messaging") has increasingly been used to reduce the problem of nonattendance through the delivery of appointment reminders (Branson, Clemmey, & Mukherjee, 2013; Sims et al., 2012), and to encourage between-session psychotherapy engagement (e.g., by enabling two-way interactions between patients and clinicians; Aguilera, & Muñoz, 2011). However, no research has examined whether information sent by patients via text during

psychotherapy can be used to predict when patients are most at risk of missing scheduled sessions. This information could provide a window into patients' daily lives, helping to clarify how clinical states relate to important treatment processes, such as psychotherapy attendance. Moreover, data that enables clinicians to identify instances at which patients are at heightened risk of nonattendance could prove invaluable to increasing attendance, powering "just-in-time" outreach to patients when they need additional support to stay engaged. In depression, daily mood, which has been found to index depressive symptom severity (Aguilera, Schueller, & Leykin, 2015), may be a particularly important predictor of attendance. The present research explores whether responses to daily mood-monitoring messages predict future psychotherapy attendance among patients with depression.

Nonattendance of Psychotherapy

Nonattendance of psychotherapy is recognized as a significant barrier to effectively implementing evidence-based mental health interventions in the community, posing substantial costs to patients and their health care providers (Mitchell & Selmes, 2007). Sporadic attendance can lead to missed opportunities to learn, review, and practice psychotherapeutic skills, and consequently may result in less than optimal benefit from psychotherapy (Aguilera, & Muñoz, 2011). Psychotherapy no-shows also lead to loss of income for clinics, wasted staff time and resources, and increased wait times for others in need (Chen, 1991; Lefforge et al., 2007).

The importance of regular, sustained engagement with psychotherapy is further supported by the dose-effect literature, which demonstrates that patients' likelihood of making and maintaining meaningful treatment gains increases with the number of psychotherapy sessions attended (Hansen, Lambert, & Forman, 2002). Reflecting these findings, early termination, defined as attending fewer than a specified "optimal" number of sessions (Swift & Greenberg, 2012), has been linked to a number of detrimental outcomes, including increased rates of medication nonadherence, lesser improvement in psychiatric symptoms, and higher rates of readmission and rehospitalization (Baekeland & Lundwall, 1975; Chen, 1991; Killaspy, Banerjee, King, & Lloyd, 2000; Mitchell & Selmes, 2007). Given the benefits of regular attendance, and the costs associated with early termination, it is important to have a better understanding of factors that predict attendance.

Prior research has identified a number of patient-level demographic factors that predict whether patients will attend psychotherapy regularly enough to be classified as "completers" rather than "early terminators." Attendance has been found to be lower among low-income and ethnic minority patients (Barrett, Chua, Crits-Christoph, Gibbons, & Thompson, 2008; Reis & Brown, 1999; Wierzbicki & Pekarik, 1993), as well as patients with lower education levels (Barrett et al., 2008; Garfield, 1994; Swift & Greenberg, 2012). Younger patients have also been found to have lower attendance rates (Barrett et al., 2008; Swift & Greenberg, 2012), although this link has not been consistently demonstrated (Garfield, 1994; Reis & Brown, 1999; Wierzbicki & Pekarik, 1993).

While prior research provides important information about *who* is at risk of nonattendance, considerably less research speaks to the question of *when* patients are least likely to attend psychotherapy. Information about time-varying factors that predict attendance is critical, because this information could be used to efficiently time outreach to patients who are at particularly high risk of nonattendance in a given week. It could also be used to shape intervention content. For example, if nonattendance is linked to low mood states, this suggests that it may be important to integrate cognitive and behavioral interventions that motivate patients to attend psychotherapy despite a low mood.

Identifying Time-Varying Predictors of Psychotherapy Attendance

Traditional intervention research collects patient data only at a few key points (i.e., at initial intake, during psychotherapy sessions, and at follow-ups). This misses patients' daily experiences as they relate to clinical disorders. Depression, for example, tends to be characterized by high levels of negative affect and low levels of positive affect (Watson et al., 1995), which is evident in depressed individuals' self-reported daily affective experiences (Bylsma, Taylor-Clift, & Rottenberg, 2011). For patients receiving psychotherapy for depression, fluctuations in daily mood may serve as an important time-varying predictor of missed appointments. Daily and weekly mood has been found to be a reliable proxy for elevated depressive symptoms (Aguilera et al., 2015), and symptoms of depression are more commonly expressed when low moods occur (Miranda, Persons, & Byers, 1990). Many depressive symptoms, including reduced motivation (Treadway & Zald, 2011), reduced gross motor activity (Sobin & Sackeim, 1997), and social withdrawal (Segrin, 2000) may interfere with attendance in psychotherapy. Indeed, retrospective reports from both psychotherapy patients (Killaspy et al., 2000) and clinicians (DeFife, Conklin, Smith, & Poole, 2010) indicate that elevated psychiatric symptoms are a common reason patients skip scheduled sessions.