

Chapter 39

Ecological Momentary Assessment Using a Mobile Phone

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ABSTRACT

The mobile phone has become a popular tool for providing information and capturing responses from different groups of people because of its technological features and portability. EMA (Ecological Momentary Assessment) is commonly used by health researchers to contemporaneously capture information regarding human experience. The authors proposed the use of a mobile EMA system as a supportive intervention to collect real-time patient data and to give back real-time advice. In this study, a mobile EMA system has been utilized by patients with a variety of conditions, including mood disorders, behavior disorders, and physical disorders. The real-time data collection included one or more pieces of information at each moment to improve understanding the causal mechanisms of disease. The effectiveness of real-time advice has been examined by comparing a mobile EMA system with and without this function. Patient compliance was high on average, at approximately 89%, and was higher, at approximately 93%, when advice was given. In several cases, the supportive intervention was shown to help patients improve their health conditions. However, the results were dependent on the patients' motivation, environment, and relationship with their doctor. The EMA data regarding advice given showed that symptoms tended to improve in most cases.

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INTRODUCTION

Ecological Momentary Assessment (EMA) is a novel method for assessing the medical status of human physiology and behavior as they occur in the natural setting. EMA aims to avoid self-reporting biases caused by delayed reporting and by uncommon environments (Shiffman, Stone, & Hufford, 2008). Since its introduction by Stone & Shiffman in 1994, EMA has been used widely in health studies conducted by researchers and physicians (Yoshiuchi, Yamamoto, & Akabayashi, 2008). The proposed EMA method has many benefits over traditional methods (Moskowitz & Young, 2006) and provides a complete and accurate medical record, which is a fundamental requirement for any medical diagnosis. The medical record not only includes information on physiology and behavior of the patient but also takes into account all related information, such as symptoms, moods, activities, and environs. Several reports on EMA applications have utilized such information and have demonstrated that psychological state powerfully influences human physiology, behavior, and experience (Kashdan & Collins, 2010; Rofey, Hull, Phillips, Vogt, & Silk, & Dahl, 2009; Wilhelm, Pfaltz, & Grossman, 2006). The evaluation of one or more related parameters provides an opportunity to better understand the causes and casual mechanisms of a disease and may thus allow a physician to deliver high-quality healthcare services.

The paper method is commonly used for maintaining a health diary, but it has several weaknesses, including retrospective recall, poor compliance, and unreliable data (Stone, Shiffman, Schwartz, Broderick, & Hufford, 2002). A mobile phone has amazing technological capabilities that have a large impact on healthcare services. The offered features of and demand for mobile phones have many merits with regard to supporting healthcare services, notably for compliance with EMA requirements.

The authors have proposed a mobile EMA system for collecting health data based on the EMA concept. The proposed system included not only a real-time report but also real-time advice and a real-time monitoring functions. The real-time advice function was used to improve health awareness by providing intervention at the appropriate time. The real-time monitoring function allowed a doctor to monitor the patient's condition.

SUPPORTIVE INTERVENTION SYSTEM USING A MOBILE PHONE

Mobile EMA System

The rapidly growth in mobile phone and wireless technologies convinced Okada et al. to utilize a mobile phone device to collect a real-time patient report over the internet using mobile networks. The resulting mobile EMA system (Okada, Hareva, Kitawaki, & Oka, 2005) was developed based on a web browser platform as a variant of the client-server model. On the EMA server side, Windows XP, Internet information service (IIS), Active Server Page (ASP), Microsoft Access, and free e-mail server BASP21 were installed. On the EMA client side, a mobile web-browser was installed to show pages of online questions linked to the prompted e-mail. The selected answers represented mood levels, symptom levels, behavior levels, and combinations thereof.

Mobile EMA System with Real-Time Advice Function

Additional use of real-time advice through the mobile EMA system was made based on the intervention requirements based on the patient's behavior (Hareva, Okada, Kitawai, & Oka, 2009). Using this function, the intervention objective should be delivered to the patient at the appropriate time and at his or her typical location. Thus, restrictions on the time, place, and manner of

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