Chapter 5

Gamification to Improve Adherence to Clinical Treatment Advice:
Improving Adherence to Clinical Treatment

Deborah Richards
Macquarie University, Australia

Patrina H.Y. Caldwell
University of Sydney, Australia

ABSTRACT

This chapter looks at how gamification of existing technology can be used to incorporate the factors that have been found to improve patient adherence. Lack of adherence to medical advice is a major problem because it reduces the likelihood of improved health outcomes and is a waste of costly and scarce resources. To provide intrinsically motivating game mechanics we discuss the use of an embodied virtual character to build an ongoing therapeutic alliance with the patient. Extrinsically motivating game mechanics are added via a game based on the token economy. The intention is to empower, engage and encourage the patient to adhere with the medical advice. A case study is provided for the condition of paediatric incontinence.

INTRODUCTION

eHealth interventions have the potential to significantly improve the quality and safety of healthcare processes and outcomes. However, without adherence to the guidance provided by the health professional via the eHealth system, these benefits will not be realised. Fenerty, West, Davis, Kaplan, and Feldman (2012) report that "up to 30%-50% of patients are expected to demonstrate poor adherence to medication use" (2012 p.128). Similar figures are reported for eHealth systems (Donkin et al., 2011). Lack of adherence is a major problem because the intended outcomes of the advice, that is, improved health outcomes, are not likely to be achieved, and the costs associated with providing that advice are

wasted (Fenerty et al., 2012; Stinson, Wilson, Gill, Yamada, & Holt, 2009). The problem is exacerbated when long wait times in receiving the advice are involved because of the possible further deterioration of the situation for those waiting and the additional costs involved in managing the condition. While adherence is a multifaceted problem and the context will differ for each patient (Karoly, 1993), we will focus on eHealth solutions that provide a therapeutic alliance and help overcome health literacy barriers.

A therapeutic alliance encompasses the degree to which the helper and client agree on the goals of the therapy and tasks to be performed, and the extent to which a trusting and empathetic bond between the helper and client is established (Horvath & Luborsky, 1993). Limited literacy (health and other forms) has been found to negatively impact the efficacy and success of eHealth systems that provide information and interventions, and promote treatment adherence (T. W. Bickmore, Pfeifer, & Jack, 2009). Limited health literacy affects over one third of American adults (Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005), nearly two-thirds of Australians (ABS, 2006) with worse figures for vulnerable populations such as children and the socially disadvantaged (Williams et al., 1995).

Games and virtual world technologies can help overcome health literacy barriers by improving medical knowledge and encouraging healthy behaviours. More importantly, gamification, "the process of game-thinking and game mechanics to engage users and solve problems" (Zichermann & Cunningham, 2011), can be used to provide therapy, treatment advice and support similar to that provided in clinical practice. We see that game elements such as goals, rules, challenges, interaction and rewards have a role to play in this context, but the relational nature of therapy requires the development of a working alliance in order to deliver lasting positive outcomes for the patient. We propose that "relational agents" are most suitable for this purpose. According to Bickmore, "relational agents are computational artifacts designed to build long-term socio-emotional relationships with users, including trust, rapport and therapeutic alliance, for the purpose of enhancing adherence to treatment" (T. W. Bickmore, Puskar, Schlenk, Pfeifer, & Sereika, 2010) p.7.

The conversational and social nature of the intelligent agent will seek to overcome barriers for patients, adults and children, who have low health literacy skills. For these cohorts, solutions involving online medical advice and treatment plans may be unattractive and do little to improve their situation. The familiar format of face-to-face conversation using a simplified and explicit method of interacting provides increased and tailored levels of engagement needed for repeated and ongoing adherence, and reduces confusion and misunderstandings (T. Bickmore, Gruber, & Picard, 2005).

The key goals of this chapter are to present the literature on relational agents for clinical practice and to present a relational agent for chronic paediatric conditions designed to improve treatment adherence and overcome health literacy barriers.

The background section covers: technology for empowerment and behaviour change; behaviour change and games; serious games and adherence; understanding adherence; increased patient agency to improve adherence and building a therapeutic alliance. We then look at the use of relational agents to build a working alliance and improve adherence specifically considering the limitations of technology, identify the right perspective and role of games, present the use of games to overcome social, health literacy and adherence barriers; present the use of agents to aid human agency and adherence, and discuss how agents can be designed to intrinsically motivate. We present a case study to explore how gamification can address the burden and health consequences of urinary incontinence in children. We explain how an existing treatment advice system was redesigned by integrating relational agents to improve intrinsic motivation and by adding gamification elements to provide extrinsic motivators. Finally we offer future directions and our conclusions for the use of gamification in clinical practice.

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