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The Wheel of Sukr: A Framework for Gamifying Diabetes Self-Management in Saudi Arabia

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Abstract

Diabetes is one of the most common chronic illnesses in the world. Saudi Arabia is one of the top countries where diabetes is most prevalent. Living with diabetes requires a great deal of care and self-management skills in several aspects of daily life. Self-care and management range from keeping records of blood glucose levels and other associated information such as food intake, to having the emotional and social support needed to cope with the condition. Even though there are a number of ways in which patients can self-manage diabetes, they do not guarantee adherence to medication or enhance self-management skills. Moreover, the existing tools and communities are not available to Saudi patients. In order to promote better self-management of diabetes we propose the use of Gamification, which is the use of game elements in non-gaming environments. Since it is more psychology than technology, it can influence the behaviour of users and motivate them to better self-manage their condition. The rewarding elements in it could help in motivating users towards healthy behaviours that they find difficult to start or maintain. It has been applied to a number of environments including healthcare, and yielded positive results in terms of increasing engagement, motivating people, and changing behaviour. Thus, in this research we propose a conceptual framework named "The Wheel Of Sukr" to assist in self-management of diabetes for young adults in Saudi Arabia. The framework emphasizes the link between gamification, and behaviour change methods. It incorporates a number of elements that are from the literature, believed to be necessary for the use of gamification in self-management of diabetes to change behaviour or reinforce positive.

Peer-review under responsibility of the Program Chairs

Keywords: Gamification; Diabetes; Self-management; Chronic illnesses; Saudi Arabia

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1. Introduction

Diabetes is one of the most common chronic illnesses in the world. In Saudi Arabia, the number of diabetics of both types is on the rise[1]. This represents a major public health concern. If diabetes is left untreated or is not properly self-managed, it can lead to devastating complications. Encouraging adherence to medication and self-management of diabetes is crucial. Even though there exist some applications that can assist in managing the illness, they lack some aspects such as social and rewarding elements. In general, users might be self-motivated to live a healthy life, but influencing their health related behaviour is not an easy task. Fortunately, there exist a number of methods and processes that promise behavioural change and could be applied to healthcare.

Gamification extends the use of game elements and techniques beyond the scope of entertainment. It is attracting a lot of attention in recent years. In fact, it has been incorporated into the services of many fields including healthcare[2]. However, not a lot of studies on gamification in self-management and adherence to medication exist[3]. Moreover, the increasing interest in the game industry in Saudi Arabia is promising[4]. Combining game elements and behavioural change methods could be effective in creating better self-management systems that reinforce healthier behaviour. This research proposes a conceptual framework that combines the concept of gamification and behavioural change methods to provide the appropriate elements to gamifiy self-management of diabetes for young adults.

2. Gamifying Healthcare

The term "gamification" stands for the use of gaming elements and development mechanics in non-gaming environments[5]. It combines the principles of engagement, reward and incentive[6] to encourage changes in behaviour, motivates users to learn new skills or increase their engagement in a playful way. With its behavioural change capabilities and the element of enjoyment it brings, gamification can help in achieving predetermined goals and objectives. This is supported by the fact that society operates in a similar manner to games in terms of having rules, and penalties, winners and losers, competitions and collaborations, individuals and teams[7]. Utilizing these features in health digital tools and services – including disease prevention behaviours and disease management- is thought to have a positive impact on users[2]. Moreover, gamification expert Zichermann is among others who argue that using the concept of gamification in healthcare websites and apps is a natural fit[8,9].

Gamification is fundamentally a motivational tool[10,11]. In general, motivation can occur in many ways to achieve personal goals, satisfy personal needs, fulfill leader expectations, and to gain rewards or incentives[12]. If gamification is used correctly in healthcare, it can motivate people to make better decisions concerning their health. Having a chronic illness requires a lot of self-care. Patients' time is drained by the many repetitive tasks they are required to do. These include, taking medication, keeping a note of their food intake, their exercises and other. Electronic tools and services can provide assistants in this department. Allowing patients to spend less and more efficient time on their self-management[13]. As Jane McGonigal stated in her book Reality is Broken, *"The more we start to monitor and self-report our daily activity… the more we will be able to chart our progress, set goals, accept challenges, and support each other…"* [14]. Gamified services with their ability to engage and motivate users have high potential in healthcare[15,16]. They can enhance the effectiveness of self-management and adherence to medication[16]. Moreover, it can improve the emotional state of patients[16]. Thus, it has been adopted by a number of healthcare applications.

It is commonly believed that rewards leave people with feelings of liking and pleasure[17]. In one hand, positive reinforces are the preferred outcomes that are given to the individual after the desired behaviour. For example, getting a bonus at work for increasing sales. On the other hand, negative reinforces are characterized by the removal of an undesired or unpleasant outcome after the desired behaviour. Thus, behaviour is strengthened as something negative is removed. In universities for example, teaching is used as a negative reinforce. The more the lecturer publishes, the less teaching hours he/she gets assigned to. When applied to gamification, positive reinforcement can be developed through the use of rewards. It can make the tedious and repetitive tasks of managing a chronic illness such as diabetes rewarding and more engaging[2]. This in return could increase the adoption of digital healthcare services, which is slow because of the poor quality design that does not meet users' needs[18]. In fact, in a recent study 75% of participant showed interest in using digital health services especially if it provides assistance with reunite health tasks[18].

Rewarding a patient for taking their medication is thought to be more effective than punishing them if they did not take their medication regularly. Gamification could play a critical role in changing some of the negative connotation associated with diabetes and self-management. In fact, gamification could turn exercising, making healthier choices, adhering to medication, and disease management into an entertaining and rewarding experience[19]. A successful example of gamification with positive reinforcement is the web-based and mobile application SuperBetter, which is a tool for self-improvement that provide users with an engaging, and interactive experiment to assist them in reaching their health goals[20]. The application maintain track of users' "quests" and presents daily and weekly to-do lists to reach goals one-step at a time.

3. Related Behavioural Theories

One of gamification's goals is to drive user's behaviour. However, influencing behaviour in healthcare situations is not an easy task[21]. According to some research, digital healthcare applications and services impact only 10% of their users[21]. Thus, to influence user's behaviour one must understand how behaviour occurs and what are the factors that contribute to it.

B.J. Fogg (2009), a researcher at the University of Stanford, proposes a model that explains how behaviour occurs[22]. The Fogg Behaviour Model (FBM) shows that human behaviour is an outcome of three elements. The first element is motivation, which is when the person has the desire to perform a certain behaviour. The second element is ability, which is when the person has the capacity to perform the behaviour. The last element is trigger, which is when the person is triggered to perform the behaviour through different cues. Moreover, Fogg states that these elements must happen at the same time in order for a behaviour to result.

Furthermore, influencing behaviours is a two-step procedure[23]. It requires both creating a new behaviour and eliminating the undesired one. There are a number of situations where people choose to change their behaviour. For example, some people are internally motivated to become healthier so they workout and eat healthy on their own. Other ways to change behaviour comes from a self-realisation, change in environment, or developing a new behaviour through a sequence of steps. The latter is called "Tiny Habits" where a planned sequence of small changes in daily routine results in the adoption of tiny habits to reach a desired behaviour[24]. The Tiny Habit method has proved to be successful in changing behaviour[25]. It relies on the fact that small changes are easier to accept than big shifts in daily behaviour.

The psychologist Csikszentmihalyi (1997) defined Flow State as a mental state of absorption and engagement in an activity/game[26]. In the flow state, the user is intrinsically motivated and completely immersed in what he/she is doing. Thus, time and physical world around the user becomes irrelevant. Moreover, engaging video game can get users into the flow state. However, the game activities should be designed according to users' skill level. Therefore, starting with easy tasks and gradually increasing the difficulty as the users' skills increase[21]. This sustains the flow state. On the other hand, if the game fails to do that, the user will either be bored if it is too simple or quit if it is too difficult.

Daniel Pink the author of the "Drive: The Surprising Truth About What Motivates Us" argues that motivation is intrinsic and it is driven by three elements[27]. First, autonomy is when people have full control over when and to what level they want to carry out the activity. In games, one of the components of autonomy is entering the Flow State. Second, mastery is getting better at a certain activity. For example, in games the sense of mastery can be reached through improvement in playing and progressing towards goals[14]. Finally, purpose where people have a reason to do an activity. Furthermore, status is another powerful motivator; because people care about their image[28].

One of the theories known to drive behaviour is the "The Nudge" theory. It is the positive reinforcement and indirect signals toward a non-forced action. Nudge theory is used to drive behaviour and it has been applied in political and economical environments[29]. It creates the simplest path to certain behaviour. The use of the nudge theory could create a good environment where gamification is used. Giving rewards and incentives as well as 'nudging' behaviour into wanted behaviours. Moreover, Michael Wu a researcher at Lithium argues gamification in its simplest forms covers the motivation element in FBM, and the nudge theory covers the two other elements, ability and trigger[30]. Designing a nudge is similar to designing a tiny habit; it has to be simple choices. However, the nudge theory requires the designer to simplify the environment and the context that leads to a certain action. On the other hand, the tiny habits method breaks down the desired behaviour into easy-to-adopt small habits.

4. The Wheel of Sukr

Keeping a healthy life style is worth praising. According to Zichermann (2011), gamification is more psychology than technology (75% to 25%)[31]. It uses the inherent urge for recognition and the need for instant positive feedback within the human nature to promote change in behaviour or drive user engagement. Through motivation, gamification can result in some goals being accomplished. It is built on the notion of setting goals, motivation and tracking progress. However, some systems that utilize gamification are not successful on the long-term. This is a result of the sole reliance on points and badges. While points and badges are part of gamification, there are other crucial game techniques that need to be considered. Thus, to gain all the advantages of gamification one needs to understand the environment it is applied to, so specific gamification techniques can be tailored and applied to this specific environment. Therefore, in this research we propose "The Wheel of Sukr" as a conceptual framework to apply gamification specifically for diabetic patients in Saudi Arabia to assist them in self-management, reinforce positive behaviour in self-management and provide a space for them to interact [Fig. 1]. The framework elements were chosen to reinforce positive behaviour and make self-management of diabetes easier, fun and rewarding.

The Wheel of Sukr provides a guideline to design a gamified self-management system of diabetes. Thus, the elements of 'fun' and 'self-management' are essential. Moreover, the 'fun' elements represent a part of gamification, and it include badges, points, challenges and competition. On the other hand, the 'self-management' elements include: logbook, visualization of data, and trend alerts. These are the elements that provide a tool to the user to save their blood glucose test results regularly and also save any related information to their results such as their food intake. Moreover, the saved data is represented visually to the user to help him/her in identifying any patterns and easily monitor their progress.

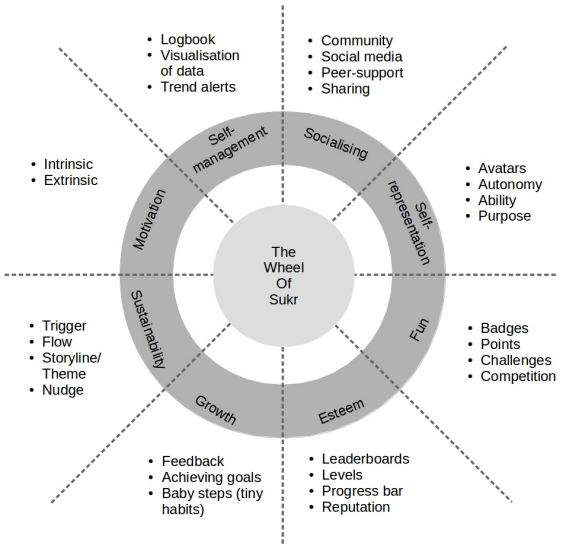

Fig. 1. The Wheel of Sukr

One of the most important aspects of the success of gamification is providing real-time feedback that is meaningful and relevant to users. Feedback can be represented in many ways, including rewards and incentives, which give immediate feedback to users about their performance. An example of that would be leveling up on a leaderboards or gaining points. Even though praise is a part of the feedback given to diabetic patients, it is not the only kind of feedback. Praising on good actions can have a great impact on patients; as well as general feedback on test results and management habits, which is part of the growth aspect of the framework. Through providing feedback in terms of graphs of blood tests the user will learn about his/her condition and will recognize any patterns.

Moreover, providing alerts when blood glucose continue to be lower or higher than average is another example of this feedback.

There are two types of motivations: intrinsic which comes from an innate desire to do something and extrinsic which is doing something only if there is a reward. The use of rewards would act as extrinsic motivation to start with. However, by implementing The Wheel of Sukr the user will develop their own intrinsic motivations, since elements such as visual representation will enhance their desire to monitor their selves and understand their situation better. Unlike the act of logging test results without the ability for them to be visualized, which is a mundane task by itself. Moreover, it is important to note that the rewards used must be tailored to the culture or group it is used in. Thus, become relevant and of value to the user.

Furthermore, the social aspect is crucial for the success of gamification. It adds to the value of "fun" elements, and covers aspects of the psychological side of dealing with diabetes. Previous chapters covered in detail how diabetes can lead to clinical depression and how common it is. Thus, we gather that it is important to provide a medium where they can share and receive support from their peers. Moreover, Maslow's hierarchy of Needs indicated the importance of having a sense of belonging[32]. Games such as FarmVille from Zynga understood that and provided social games that address the need for social cohesion and acceptance in people[30]. In Saudi Arabia, social medias in general are very popular, however, there is a lack of social media or online space for diabetic patients. Thus, providing an online community can be useful, and could help in increasing the social support that patients' needs as well as add a different spin to managing illness without creating more tasks for the patient's to do.

Relevantly, based on Maslow's work it is believed that people need to be respected, feel good about their achievements and have self-worth. In fact, people do things to be recognized and to be valued. Fortunately, most gamification elements are esteem boosters when designed for the right context. Furthermore, users see their name levelling up in a leaderboard, their progress bar advances, or accumulation of a number of badges, it will satisfy their need for recognition and positively affect their self-esteem in general.

Furthermore, it is important to represent the user and their goals and abilities in the gamified system. Moreover, self-representation of users is achieved partially through providing customized profiles and avatars. This could lead to an increase in their ability to relate to the system. In addition, giving users the chance to set their own goals such as glucose level goals will enhance their sense of autonomy and will tailor the experience to them.

Lastly, to ensure sustainability of gamification effects a number of elements (trigger, flow, storyline/theme, and nudge) are added to The Wheel of Sukr[33]. These elements are derived from game design and behavioural theories. Having flow and a storyline or a theme is a proved to be effective in capturing the long-term attention of users in video games. On the other hand, trigger and nudge are behavioural theories that are believed to shift the behaviour of the user to the desired direction. In this context, using the nudge theory and triggers may reinforce positive behaviour in managing diabetes.

5. Conclusion and future work

In conclusion, this paper has overviewed the concept of gamificaiton, which borrows from the techniques of games but is not a game by itself. It uses the inherent urge for recognition and instant positive feedback in the human nature to promote change in behaviour or drive user engagement. Moreover, it has been shown that gamification can be used with behavioural insights to change behaviour in particular in healthcare.

Moreover, there is a need for self-management applications in Saudi Arabia. The country has a high percentage of diabetic patients (3.6 million in 2013) and it is one of the top countries in the prevalence of diabetes. Having diabetes requires a lot of self-management skills to maintain a healthy life. Gamifying self-management of diabetes in Saudi Arabia can have a positive impact. It can turn the tedious and repetitive tasks of managing diabetes to a more rewarding and engaging activity. As well as change the negative connotation associated with this illness.

In light of this we have proposed the wheel of sukr, which is a conceptual framework that applies the concept of gamification in managing diabetes. The framework consisted of eight elements: self-monitoring, socializing, self-representation, gamification, esteem, motivation, sustainability, and growth. Each one of the elements has a number of sub-elements. In the future, the framework elements will be validated through conducting expert interviews and questionnaires.

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