The Development and Acceptability of a Board Game to Supplement Standard Diabetes Education at the University of Santo Tomas Hospital

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Abstract

Introduction: The potential efficacy of a board game in health education has been demonstrated. This study aims to develop a simple and useful diabetes education board game for adult Filipinos with T2DM that can supplement diabetes education.

Methods: This study used a mixed methods design involving a multistep process to develop and evaluate the board game. The initial phase involved the generation of comprehensible illustrations. Diabetes experts including three endocrinologists, one diabetes education nurse, and one dietician and 20 patients evaluated each illustration incorporated into the game board patterned after snakes and ladders. Twenty adult patients were then recruited to play the board game. Each patient subsequently completed a survey regarding perception of the game's acceptability in terms of usability, replay appeal, and ability to reinforce knowledge.

Results: The illustrations' comprehensibility or mean correct response of participants to the illustrations was 75%. At least 50% of patients correctly identified each of the illustrations. Eighteen (56.25%) out of the 32 illustrations had a mean correct response of 75% or higher. The illustrations were perceived to depict their intended meaning (translucency). All illustrations had a median translucency score of five and above in a scale of one to seven. The game had a high median rating for acceptability of five on a scale of one to five. All the participants agreed that they liked playing the game and would recommend the game to other patients with diabetes.

Conclusion: The developed adult diabetes board game – "Winning at Diabetes", is a simple, useful and acceptable supplement to standard diabetes education.

Keywords: diabetes education, adults, diabetes mellitus type 2, board game

Introduction

Diabetes mellitus type 2 (T2DM) demands lifelong management in order to avoid costly, debilitating, and life-threatening complications.[1] Unfortunately, even with the high prevalence of diabetes.[2,3] access to education and support remain limited especially in remote rural communities. Furthermore, there are very few physicians attending to so many patients with little time This condition can sometimes make the management of T2DM in adults frustrating and difficult.

The management of diabetes is complex and requires continuous medical care with multifactorial risk-reduction strategies beyond glycemic control.[4] In order to achieve these, patients need to be empowered through education in order that they may actively participate in their own care. Diabetes education is now recognized to be indispensible in the care of patients. Various strategies aimed at increasing diabetes knowledge such as individual and group diabetes education in newly diagnosed T2DM,[5] intensive management programs in patients with poorly controlled diabetes[6], and frequent telephone contacts[7] have been shown to improve hemoglobin A1C, blood pressure, low density lipoproteins (LDL) and cholesterol levels compared with control participants. That diabetes education can improve clinical outcomes is one of the guiding principles behind Diabetes Self-Management Education (DSME).[8]

Efforts to bridge the gap in knowledge to enable patients to make informed decisions with regards to the management of their disease have evolved from the standard didactic teaching to more interactive learning sessions. This gap in education leaves room for the development of alternative methods of learning for patients with diabetes. The

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Conversation Map™ was developed to facilitate group education[9-10] and has been shown to improve diabetes knowledge compared with regular care particularly in countries where no structured diabetes education and awareness programs are in place.[11] The Conversation Map™ has been validated in many countries however standard application of the map tools calls for one to two hours at most spent on each map, with one session every one to two weeks and requires guidance of a healthcare professional trained in the map tools.[12]

Educational games

The use of games and toys for learning can complement standard diabetes education. Educational games are defined as an instructional method which requires the learner to participate in a competitive activity with preset rules.[13] It can also be defined as a type of experiential learning where the learner engages in a particular activity, looks back at the activity critically, abstracts some useful insight from the analysis, and puts the results to work.[14] Educational games have potential advantages. The competitive nature tends to motivate participants.[15] It promotes learning in the cognitive, affective, and psychomotor domain[16,17] as well as encourages communication and social interaction among members.[18] The participants can develop alliances with mutual respect which promotes team work and collaboration.[19,20] Of particular importance to this study is the ability of educational games to be conducted both in and out of a classroom setting, as well as, become a learner-initiated activity requiring little to no assistance from teachers or educators.[21]

Educational games for health education

Educational games related to health have been developed and its potential efficacy have been reported. Card games and board games have been shown to improve communicative skills and promote active learning through interaction with other players.[22,23] Board games that involve both teachers and students had been used in community-wide disease control and prevention programs,[24] as well as in nutrition education.[25,26] Another game is "AIDS Challenge" (two-stage) game from Malawi with the potential to reach people in difficult social and enviromental settings. The game is a typical snake-and-ladder-game with 100 cards making wrong and correct statements about HIV and AIDS. Playing the game repeatedly during four weeks increased the knowledge of players' significantly and also influenced the behaviour in the families of the playing children.[27] A study that investigated the effect of an interactive computer game on children with asthma was shown to be effective in promoting asthma self-management in pediatric care.[28] Likewise, a study for hypertension investigated the impact of a simulation game wherein the patient interacts with avatar-based health care professionals. This study demonstrated preliminary efficacy in facilitating clinically significant reductions in systolic and diastolic blood pressures.[29] In the Grechus and Brown study, they compared a board game and a computer game on a nutrition topic to determine knowledge outcomes.[26] They found out that board games were as efficacious as computer games, thus bolstering the potential value of board games for use in developing countries as appropriate technology as well as state-of-the-art technology.

Educational games for diabetes

Educational games have also been designed for diabetes. "Insulot" is a cellular phone-based entertainment learning tool for children with type 1 diabetes mellitus (T1DM) designed to teach relationships among plasma glucose level, food, and insulin dosage.[30] In India, Snakes and Ladders has been adapted for the education of children with T1DM,[31] and women with gestational diabetes.[32] The game is an adaptation of an ancient Indian board game where the square at the base of the ladder represents good habit or the do's of diabetes care while the square at the top of a snake represents bad habit or the don'ts of diabetes care. The game can easily be adapted to suit varying learning needs.

The board game as a diabetes educational tool can motivate patients to learn about diabetes by self-management. It will reinforce whatever knowledge is taught by the physician, diabetes nurse educator, and dietician educator. In doing so, the adult patient with diabetes will learn in a playful manner resulting in a more constructive attitude towards diabetes and enhanced ability for self-management.

Significance of the study

The lack of trained health professionals and programs to train health professionals continues to be cited by many member organizations of the International Diabetes Federation (IDF) as the most critical issue impeding the delivery of high quality diabetes education and care. This is a serious concern because early conversation with the patient is necessary to break the ice and win the trust not only of the patient but also of the family. In Asian countries, where the ratio of physician to patients is 1:20, this may not be feasible because of the short duration of time available to interact with each patient. Though the nurse educator is available for consultation it is an additional expense on the patient and still some topics for learning necessary for a patient with diabetes to survive may be missed. A Filipino trait which is the strong interdependence to family members resulting to being clannish, and protective of each family member might be helpful but may also be a barrier to diabetes education. This is true if the family member is not knowledgeable of the facts about diabetes and what will be perpetuated are the myths in diabetes. Because of this, it is logical and imperative to design an intervention that is suitable for use in any setting – whether in a diabetes education center or at home or anywhere, where there can be interaction between

patients, the patients' relatives and/or friends. This is in the hopes of creating an informed support group for the patient. No board games developed for adult diabetes have been published in the Philippines. The simplicity of the game and relative popularity of snakes and ladders makes it an ideal game to adapt for diabetes education as many are familiar with the game concept and, if not, the mechanics of the game is easy to understand.

Objectives

While telemedicine can be effective, given the high use of cellphones within the Filipino population, the use of smartphone is not as widespread for the cost is limiting. Our primary objective of this study is to develop a simple and useful diabetes education board game for adult patients with T2DM that can supplement diabetes education in environments where no computer or high-tech teaching tool is available. The secondary objective of this study is to assess the acceptability of the developed diabetes education board game as a supplementary educational tool.

Methods

Design and population

This study was approved by the University of Santo Tomas Hospital (USTH) Institutional Review Board (IRB) and Ethics Committee. Each participant was provided with informed consent to participate in the study. The study was conducted in the USTH St. Thomas Diabetes Center and involved adult patients with T2DM. There was a total of 40 participants, 20 of which evaluated the illustrations by answering a self administered questionnaire designed by the author in either Filipino or English and another set of 20 participants who played the developed board game and answered a self-administered questionnaire designed by the author in either Filipino or English to evaluate the board game. Convenience sampling of patients referred to the USTH St. Thomas Diabetes Center for diabetes education was done. All participants voluntarily gave informed consent. The study employed a mixed methods design involving a multi-step process to develop and evaluate the board game.

Game design

We used the social cognitive theory as a guide for the overall design of the interventional aspect of the board game. It seeks to explain behavior through various expectancies and incentives. Behavioral theories explain what influences people to do the things that they do. They identify the determinants of behavior or the factors that are casually related to the behavior.[33] We reviewed and adapted the IDF International Curriculum for Diabetes Health Professional Education[34] as well as the Standard of Care of the American Diabetes Association[35] for the development of the board game. We chose what " Do's" or " Don'ts" are appropriate from the various modules that we reviewed. Self-efficacy, the key social cognitive theory construct, was intended to increase through learning about specific environmental behaviors related to diabetes along with vicarious learning and reinforcement. The game board of "Snakes and Ladders" and the answer keys to the illustrations help elucidate and increase behavioral capability through expanded diabetes related knowledge. Other learnings were obtained from other players about diabetes as the game was being played. Reinforcement was achieved through correct identification and discussion of the illustrations on the game board which represented good or bad diabetes practices and outcomes. The game is designed such that patients are encouraged to actively discuss the illustrations as they pertain to diabetes practices and outcomes with the intention to increase their self-efficacy.

Development of the board game Winning at Diabetes

Step 1: Literature search

A search was made for all educational games for diabetes listed in the PubMed database, of medical games for free download on the internet, of all commercial games dealing with diabetes listed in the international game databases.

Step 2: Identification of game category

Game categorization is done either by game mechanism or by the complexity of the underlying concept of learning by experience.[36] The complexity of experiential learning cycles as a categorization criterion was chosen.

Step 3: The focus group

The focus group was composed of: a fellow of endocrinology (author), one physician diabetes educator (co-author), one nurse diabetes educator, and one diabetes nutritionist educator)

Step 4: Identify game set–up

Dice and luck games are usually two-stage games where the result of the players' action does not necessarily depend on abstraction and a new plan for the next turn, but on the result of a random event (i.e. throwing a dice). e.g. Snakes and Ladders

Snakes and Ladders was unanimously chosen.

Step 5: Identify the topic of the game: diabetes mellitus

The focus group met to determine what concepts of diabetes practices and outcomes are going to be illustrated onto the board game based on the following materials namely: IDF curriculum, ADA guidelines 2016, healthy lifestyle campaign (DOH), food pyramid guide to curb overweight and obesity among Filipinos, "Pinggang Pinoy", and USTH St. Thomas Diabetes Center's education modules

The content of the game board consisted of the following modules: diabetes overview, nutrition and exercise, glucose monitoring and insulin administration, and foot care. The good and bad practices were reviewed and selected by the focus group of experts to identify appropriate content for illustration. Illustrations depicted pertains to diet, lifestyle, oral hypoglycemic agents and

insulin and self care interventions taught in standard diabetes education modules of the St. Thomas Diabetes Center of the USTH, as well as symptoms and complications of poorly controlled diabetes.

Step 6: Identification of the target group: adult patients with T2DM, families & friends

Step 7: Condition of victory: competitive

Step 8: Knowledge transfer: yes

Step 9: Evaluation

Instrument design

Snakes and Ladders is an ancient Indian board game regarded today as a classic game played between two or more players on a game board having numbered and gridded squares. A number of "ladders" and "snakes" are pictured on the board, each connecting two specific board squares. The objective of the game is to navigate one's game piece from the start (bottom square) to the finish (top square), helped or hindered by ladders and snakes, respectively. The historic version had root in morality lessons, where a player's progression up the board represented a life journey complicated by virtues (ladders) and vices (snakes).

Instrument development

Learning objectives for each module was made. The Focus group allowed room for only one "ladder" and a "sticky note" describing the diabetes practice or outcome on each square. The appropriate diabetes practices or outcomes for a particular module were discussed. The constraints inherent is in how the game is designed (use of the board with 100 squares, constraint of placing only one diabetese practice or outcome in a single square, requirement to `travel from one to the 100th square and the need to decide on length of snake and/or ladder and where to place it, all had the focus group think more deeply about what modules to select, how to sequence it on the board with respect to other modules. Subsequently, we identified a limited number of diabetes practices and outcome for illustration. There were things to consider namely; 1) the need to sequence the diabetes practices and outcomes as reflected by the length and order of the ladders to give time between ladders to allow for discussion before new concepts are introduced; 2) to select the placement of snakes which introduces the idea of risk for diabetes and its complications. The placement of the snakes identified bad practices or "don'ts" as well as what could happen – "bad outcomes" or diabetes complications, if bad practices were preferred instead.

Generation of illustrations

The identified content were illustrated by artists with a background in health communications. Illustrations were made colorful and engaging. The artists contracted for the illustrations conducted an evaluation of different versions of each individual illustration with lay Filipino participants and submitted to the authors the illustrations which were best understood and correctly identified by the lay participants.

Evaluation for comprehensibility and translucency

It is integral to the concept of the game that the illustrations are understandable to Filipino diabetics. The concept of comprehensibility (or ability to guess) and translucency were adopted from studies that developed illustrations for asthma education and chronic obstructive pulmonary disease.[37,38]

Comprehensibility of an illustration was determined by whether the practice or outcome the illustration intended to portray can be correctly identified. Translucency pertains to how closely the evaluators thought the illustration portrayed the intended diabetes practice, or outcome.

Each illustration was first evaluated for comprehensibility. Participants were given copies of the illustrations and asked to identify the diabetes practice or outcome each illustration is trying to convey. After all the illustrations were identified, an answer key to the illustrations was given and participants were asked to give the illustration a translucency score between one to seven. A score of one indicated no relationship between the illustration and its intended meaning while a score of seven indicated a very strong relationship. This study aimed to achieve a translucency score of at least five for each illustration. Participants were encouraged to give their comments and suggestions on how to improve the illustration's translucency score, which served as the basis for further amendments to the illustrations.

Panel of experts

The final layout of the board was presented to the Panel of experts (three endocrinologists) who approved the selection of illustrations.

Game testing and implementation

From the conventional snakes and ladders board game, a Filipino diabetes educational board game was designed and developed - "Winning at Diabetes". The game was designed in a way in which the board consisted of 100 squares arranged in 10 columns and 10 rows with 32 illustrations representing diabetes practices and outcomes. The square at the base of a ladder was represented by a good diabetes practice or outcome. The square at the head of a snake was represented by a bad practice, or outcome. The game's components consisted of a playing board and an answer key. Answer keys promoted advancement through correct responses. The play objective was to reach the "Finish" square.

Rules of the Game

Number of players: two to six players

Order: Each player will throw a dice, which will dictate the order of the players. The person with the highest number will be the first player followed by the player with the second highest number. The player who throws the lowest number will be the last.

Manner of play: According to the order of players, each player will take turns throwing the dice and moving his or her counter starting at square one according to the number shown on the dice. The players must identify how the picture on the square relates to diabetes or diabetes self care. (Players may refer to the answer key to confirm their answers.) If the counter stops at the head of a snake, the player must identify the bad habit, practice, or outcome depicted by the illustration then slide his counter down until it gets to the tail and carries on from there. If the counter lands on the foot of a ladder, the player must identify the good diabetes habit, practice, or outcome depicted by the illustration then move his/her counter to the top of the ladder and carries on from there. The first player who reaches or passes the 'Finish' square is the winner.

Assessment of acceptability of Winning at Diabetes

Another major aspect of a game's success is acceptance by the potential players. A game is only suitable for knowledge transfer if it is played at all. Is the game fun to play? Is there replay appeal? A boring game that is not played because it does not cause excitement cannot transfer knowledge. As an experiencial learning cycle only works when the cycle is repeated, the motivation of playing and learning should be considered in future evaluations.

Twenty adult patients with T2DM referred to the St. Thomas Diabetes Center for diabetes education were invited to play the board game. After playing the game, each participant answered a questionnaire developed by the author to determine the acceptability of the game. The questionnaire contained eight likert-type items graded from one to five where a grade of one meant that you strongly disagreed with the statement in the questionnaire and five meant you strongly agreed and two open-ended questions specifically what they liked and disliked about the game. The statements evaluated the participants perception of the game's usability, replay appeal, and ability to reinforce knowledge.

Debriefing

Debriefing was done by the author after the participants had played "Winning at Diabetes". The illustrations and the concepts behind the diabetes practices and outcomes illustrated on the board game were discussed with the patients after they answered the acceptability questionnaire. The debrief was also a venue for the participants to raise questions or share experiences they have had as it pertains to the concepts of diabetes care and outcomes illustrated on the board. Getting them to share these experiences helps other participants gain awareness about potential risks or encourages sharing of similar experiences.

Statistical analysis

Descriptive statistics were used to summarize the clinical characteristics of the patients. Frequency and proportion were used for nominal variables. Medians were used for ordinal variables. Recurring themes were identified for the open ended questions and assigned a code. The frequency that these themes were encountered was described.

Results

The total number of participants who evaluated the illustrations was 20 with a mean age of 59±8.19 years old. More than half of the participants were females (85%) and half were college graduates (55%). The mean duration of time since diagnosis of diabetes was 8±6.69years.

To evaluate the comprehensibility of each illustration, 32 illustrations were shown to the participants and they were asked to identify what each illustration portrayed. The mean correct response to the illustrations was 75% with the illustration that depicted a person forgetting his medication having the lowest percentage of correct responses of 50%. (Table I). Eighteen (56.25%) illustrations had a mean score of 75% or higher.

To evaluate the translucency of each illustration, each subject scored the illustration from one to seven on how closely they thought the illustration portrayed the intended diabetes practice, or outcome. A score of one indicated no relationship between the illustration and its intended meaning while a score of seven indicated a very strong relationship. About 96.8% of the illustration had a median translucency score of five or higher. The lowest median translucency score of 4.5 was obtained by the illustration depicting foot inspection (Table I).

The total number of participants who played and evaluated the game for acceptability was 20 with a mean age of 58±10.82 years old. More than half of the participants

Table I. Comprehensibility and translucency results (N=20)

Illustration	Comprehensibility correct (%)	Translucency (Scale of 1-7)
Exercise for 30 minutes *Magehersiyo ng 30 minutos*	19 (95%)	7 (1.7)
Maintain normal blood pressure *Panatiliing normal ang presyon ng dugo*	19 (95%)	7 (2,7)
Inspect your feet *Suriin ang mga paa*	12 (60%)	4.5 (1,7)
Hyperglycemia *Mataas ang asukal sa dugo*	18 (90%)	7 (4,7)
Regular insulin injection *Regular na pagineksyon ng insulin*	20 (100%)	7 (3,7)
Eat regularly and on time *Kumain sa tamang oras*	12 (60%)	6 (1,7)
Normal capillary blood glucose *Normal na asukal sa dugo*	18 (90%)	7 (2,7)
Lower extremity amputation *Pagkaputol ng paa*	18 (90%)	7 (1,7)
1 fruit exchange = *1 piece small lakatan = 40 kcal*	13 (65%)	7 (2,7)

Table I. Comprehensibility and translucency results (N=20)

Illustration	Comprehensibility correct (%)	Translucency (Scale of 1-7)
Wear proper footwear Magsuot ng tamang sapin sa paa	14 (70%)	7 (1,7)
Excessive alcohol intake *Labis na paginom ng alak*	18 (90%)	7 (1,7)
Blindness *Pagkabulag*	16 (80%)	7 (1,7)
Hypoglycemia *Mababang asukal sa dugo*	14 (70%)	7 (1,7)
Read nutrition labels *Magbasa ng nutrition label*	13 (65%)	6 (1,7)
Excessive carbohydrates *Maling sukat ng mga pagkain*	16 (80%)	5 (1,7)
Plate method/Portion control *Tamang sukat ng mga pagkain*	15 (75%)	7 (1,7)
Forgetting/missing one's medications *Nakakalimot uminom ng gamot*	10 (50%)	5 (1,7)
Not smoking *Hindi paninigarilyo*	19 (95%)	7 (1,7)
Obesity/overweight *Labis na katabaan o timbang*	15 (75%)	7 (2,7)
Washing one's feet/ Foot hygiene *Paghuhugas ng mga paa/ Panatiliing malinis ang mga paa*	11 (55%)	6 (1,7)
Sedentary lifestyle *Palaupong pamumuhay*	11 (55%)	6 (1,7)
1 carbohydrate exchange = 2 slices *wheat bread* = *100 kcal*	17 (85%)	7 (4,7)
1 low fat meat exchange=5 pcs *suwahe na hipon = 41kcal*	11 (55%)	5 (1,7)
Skipping meals/missing meals/not eating on time *Hindi kumakain sa tamang oras/ nagliliban sa pagkain*	11 (55%)	5 (1,7)
Walking barefoot/ *Naglalakad na walang sapin sa paa*	16 (80%)	7 (1,7)
Taking medicine regularly and on time *Paginom ng gamot sa tamang oras*	18 (90%)	6 (3,7)
Smoking Paninigarilyo	20 (100%)	7 (3,7)
Eye exam *Check-up ng mga mata*	14 (70%)	7 (1,7)
Polydipsia *Labis na pagkauhaw*	15 (75%)	7 (1,7)
Foot ulcer/ Foot wound *Ulcer sa paa/ Sugat sa paa*	19 (95%)	7 (2,7)
End stage renal disease/Kidney failure requiring dialysis *Pagkasira ng kidney na nangagailangan ng dialysis*	12 (60%)	7 (1,7)
Polyuria *Labis na pagihi*	12 (60%)	5 (1,7)

Comprehensibility – whether the diabetes practice or outcome the illustration intended to portray was identified. Values are expressed as percentage (N = 20).
Translucency – how closely the evaluators thought the illustration portrayed the intended diabetes practice or outcome. Illustrations were given a translucency score from 1 to 7, where a score of 1 indicated no relationship between the illustration and its intended meaning and a score of 7 indicated a very strong relationship. Values were expressed as median, minimum, maximum (N = 20).

Table II. Acceptability questionnaire

	Median (min,max)
I liked playing "Snakes and Ladders – A Diabetes Education Board Game". *Nagustuhan ko ang paglalaro ng "Snakes and Ladders – A Diabetes Education Board Game".*	5 (4,5)
I would play this game again. *Maglalaro ako nito uli.*	5 (1,5)
I would play this game in my free time. Maglalaro ako nito sa aking libreng oras	5 (4,5)
I would recommend this game to other diabetic patients. *Irerekomenda ko ang larong ito sa ibang mga pasyenteng may dyabetis.*	5 (5,5)
I would play this game with my family and/or friends. *Maglalaro ko nito kasama ng aking mga kapamilya at/o mga kaibigan.*	5 (4,5)
I understood why landing on a particular illustration resulted in going up the ladder, i.e. the illustration reflected good diabetes care or outcome. *Naiintindihan ko kung bakit ang paglapag sa isang partikular na larawan ay nagreresulta sa pagakyat ng hagdan, i.e. ang larawan ay nagpapakita ng tamang pagaalaga sa dyabetis or mabuting kalalabasan ng dyabetis.*	5 (5,5)
I understood why landing on a particular illustration resulted in sliding down the snake, i.e. the illustration reflected poor diabetes care or outcome. *Naiintindihan ko kung bakit ang paglapag sa isang partikular na larawan ay nagreresulta sa pagbaba patungo sa dulo ng buntot ng ahas, i.e. ang larawan ay nagpapakita ng maling pagaalaga sa dyabetis or masamang kalalabasan ng dyabetis.*	5 (4,5)
Playing "Snakes and Ladders – A Diabetes Education Board Game" helps reinforce the knowledge I have learned from standard diabetes education. *Ang paglalaro ng "Snakes and Ladders – A Diabetes Education Board Game" ay nakatulong na pagtibayin ang aking natutunan mula sa standard na edukasyon sa dyabetis.*	5 (4,5)

**Each statement was given a grade from 1 to 5 where 1 meant the evaluator strongly disagreed with the statement and 5 meant the evaluator strongly agreed. Values expressed as median (N = 20)*

were females (70%). More than half were college graduates (70%). The mean duration of time since diabetes diagnosis was 10.78±6.53years. One run of the game can be completed in 15-30 minutes depending on the number of players and how engaged they are in discussing the illustrations.

Ten post-game survey questions (designed by the author) were used to determine the acceptability of the game. Eight of the survey questions were in likert-scale items graded from one to five, where a grade of one meant that you strongly disagreed with the statement in the questionnaire and five meant you strongly agreed. The remaining two questions were open-ended questions inquiring what the participants liked and disliked about the game. All eight likert items had a median grade of five (Table II). All respondents agreed they liked playing the game. All participants claimed that they would recommend the game to other patients with diabetes. Nineteen out of 20 participants agreed with the statement that they would like to play the game again. The single respondent who disagreed with the statement

Figure 1. Snakes and Ladders: A Diabetes Education Board Game

explained on follow-up interview that she is too busy taking care of her grandchildren at home and she had no time. For the open-ended question regarding what the players liked about the game, 14 (70%) spoke about how the game was informative. Seven of the respondents found the game entertaining. The following comments from the participants illustrated this point: "Nakakalibang and may natututunan ka tungkol sa diabetes"; "Nadadagdagan ang aking kaalaman tungkol sa diabetes"; "Informative"; "Nakaka-alis ng stress": and "Nakaka-aliw". Other recurring sentiments about the game was that it promoted recall of the do's and don't of diabetes.

Regarding what they didn't like about the game, one subject noted that small texts accompanied some illustrations and another subject recommended to change the shiny material the board game was printed on.

Five (26.31%) participants suggested placing captions on each illustration to easily understand the pictures. Majority of participants preferred no or minimal printed text to accompany the illustrations. The following comments illustrated their sentiments: "presentation without text is better because it prompts patients to think" and "mas magandang wala para napaguusapan ang picture"

Discussion

We had developed a useful and easily adaptable educational tool for T2DM, the "Winning at Diabetes" board game.(Figure 1) It is an easily accessible and time-efficient way to get our patients with diabetes to engage with each other as well as with relatives, and friends. It is peer-mediated with little need for the involvement from the diabetes educator after the whole game has been explained. As to the development of the board, the need to decide as a group as to what goes on the board and where it goes resulted in a high level of interaction which is stimulating. The authors also realized that the game board cannot be too crowded with illustrations. So much as we want to include more diabetes concepts, we just have to choose the more important ones. The game mechanism and the game's level of complexity are both independent of a games topic, cultural background, target group, and other factors like game setup, the condition of victory, the kind of knowledge transferred and replay motivation related to it. The complexity of learning cycles included in the game concept gave us a good hint at the replay motivation and the target group of the "Winning at Diabetes". The game mechanism is a relevant criterion to decide if a game suits in the actual teaching concept.[33] The investigators found

that game development and playing both provided rich information during debriefing at the focus group dynamic level and content level which confirmed Lederman's statement that debriefing is an essential part to learning, to the design process and to the effectiveness of the educational game. Actually, a large part of the learning in this game occurred in the design process.[39]

The majority of participants are able to correctly identify the illustrations and perceive the illustrations to portray its intended meaning. Likewise, participants rated the game process with high acceptance receiving mostly a score of 5.00 showing it to be an acceptable supplement to diabetes education as evidenced by their positive response to the game survey. Games in health education have been found to be highly acceptable as seen, for example, in the Venezuelan study wherein an educational game about Aedes aegypti control was rated high on acceptability by participants.[40]

As mentioned, this game has been adapted in India for children with T1DM and women with gestational diabetes, however, the articles made no mention of how the tools were received by its target users.

Feedback from the experts and patient participants who evaluated each of the illustrations provided insights on how to improve each illustration in order for them to become as easily understood or comprehensible as possible. For example, in the original illustration for "foot inspection", the illustration was interpreted as a "swollen foot" or "injured foot". We modified the illustration by removing an element that distracted from its intended meaning - specifically the removal of the red-orange lines that were initially intended to emphasize inspection of the foot (Figure 2). Despite these steps, it cannot be avoided that players may still not be able to identify the illustration as intended. In order to ensure that the illustrations are interpreted correctly, an illustration key accompanied each board game. It was also anticipated and observed, despite measures to prevent it, that some participants had difficulty reading words and/or numbers that accompanied some illustrations. Because of this, printed text was kept at a minimum and printed in a large readable font size.

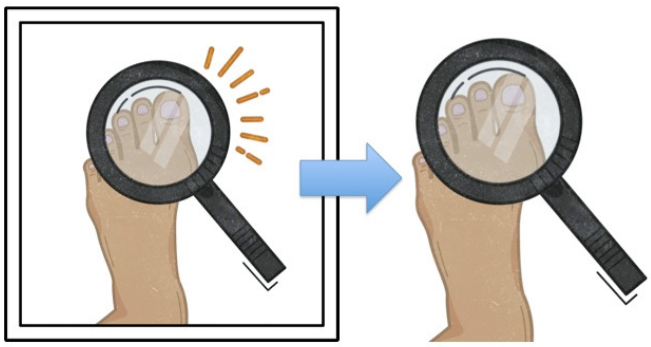

Figure 2. Sample illustration – "Inspect your feet"

This illustration intended to convey foot inspection as a good diabetes practice but misinterpreted as a "swollen foot" or an "injured foot". The illustration was then modified by removing an element that distracted from its intended meaning – specifically the removal of the orange lines beside the magnifying lense.

The debriefing was designed to assess whether the participants understood the purpose of the board game and to measure its acceptability. They all universally agreed that the game reinforced the knowledge gained from standard didactic diabetes education. When participants were made to identify illustrations, they are prompted to recall what had been taught to them about diabetes. Should a player find an illustration challenging to interpret, it can stimulate other players to help and share their understanding of what the illustration intends to portray thus promoting conversation about diabetes care. The survey responses also suggested that the participants found the board game entertaining. If we are able to make learning about diabetes fun, we can keep our patients motivated and engaged. The positive responses to questions about playing the game again with friends and family are encouraging as this study intended to develop a tool that can reinforce and share knowledge about diabetes not only with patients with diabetes but also with the people who participate directly or indirectly in the care of patients with diabetes.

One of the limitations of this game is that it is difficult to ensure that the players will adequately engage themselves in the identification and, hopefully, discussion of the illustrations. Since snakes and ladders is a game of chance, where one's movement is determined by the roll of a dice, it is important to emphasize that players need to identify why a particular illustration moves them upward or downward in their diabetes care in order for the game to be educational and informative. One way to help guarantee this is by requiring the player to correctly identify the illustration they landed on first to either 1) make use of the opportunity to move up a ladder should they land on an illustration with a ladder or; 2) avoid sliding down the snake and remaining on the illustration they landed on and then moving on from there on their next dice throw. This modification to the game's mechanics may be suitable to more motivated players. Another way to address this situation is by requiring the players to refer to the answer key that pertains to the illustration and discussing why the diabetes concept moves them up or down the game board. This limitation was addressed in the phase two of this study, which investigated the effectiveness of the board game as reinforcement intervention to standard diabetes education.

Another limitation of the study is that the statements in the acceptability questionnaire were all worded positively. The decision to pose items in the same direction was made to avoid item confusion and misinterpretation, which are identified disadvantages to alternating items and reverse wording. It is commonly believed that reverse wording

can reduce acquiescent bias and extreme response bias. However, some studies have also shown it to be ineffective.[41] The game concept of this board game is easy to understand. Thus, the game itself has the potential to be a learner-initiated activity that requires minimal to no assistance from educators to implement. It can be brought home by patients and played with friends and family. While time with professional health care providers may be limited, it is the authors' hope that diabetes education can continue outside the clinics and into the patient's home through this game. By playing with friends and family, the game provides the players the opportunity to reinforce their knowledge about this chronic illness.

Conclusion

"Winning at Diabetes", a board game for diabetes is a simple and acceptable supplementary tool for diabetes education in adult Filipinos that can be used in settings where computer or other high tech teaching tools are not available.

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Contributors

The authors have confirmed that all authors meet the ICMJE criteria for authorship credit (www.icmje.org/ethical_1author.html), as follows: (1) all the authors formulated the study concept and design; (2) CAYPG extracted the data; (3) all authors interpreted the result or acquisition of data or analysis; (4) drafting the article or revising it critically for important intellectual content; (4) CAYPG & MHSG drafted the manuscript.

Conflicts of interest

Cecilia Angela Y. Paraiso-Galang has no conflicts of interest. Maria Honolina S. Gomez received honoraria as a clinical trial investigator for Takeda; Sanofi-aventis and Glaxo Smith Kline.; received speaker fees from Boehringer Ingelheim, Pfizer, Novo-Nordisk, Torrent Pharma, Novartis and Astra-Zeneca. In no way is Dr. Gomez, nor her family, have personal stakes/ownerships in any of the aforementioned companies.

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