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Amigo: Prevention through Multiple Composite Scenarios

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Thesis
Amigo: Prevention through Multiple Composite Scenarios

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Abstract

Most work on persuasion in the HCI community relies on the perpetuation of a good behavior, once a problem already exists, rather than on stopping it from happening in the first place. The majority of those persuasive tools evaluate user performance based on what they already know, instead of continuously increasing their scientific knowledge as they make progress throughout the application. And, to our knowledge, the different stages in the development of a health condition have not been considered in the design and evaluation of such tools. In this work we introduce Amigo, an innovative form of persuasive serious game, that uses a methodology we developed called Multiple Composite Scenarios (MCS) to prevent bad eating habits in young japanese scholars. Amigo is a Visual Novel, a sub-genre of Adventure Games, known for its user engagement with the story and characters. We describe in depth the Multiple Composite Scenarios (MCS), a process we use to display recommended content on nutrition and treatment of bad eating habits, following recommendations for successful treatment and recovery from such condition, and which depicts the consequences of eating disorders, based on the Unconscious Thought Theory. We narrate the course of our work after two experiments, discuss our findings and limitations, and mention the scope for our future work.

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Chapter 1

Introduction

Multiple factors have been considered when designing health-related persuasive applications in the past. From design to usability, many considerations have been done, going through attractive gameplay and even sensors [9, 21, 25, 28, 32, 49], in an aim to persuade and avoid user rejection. Yet, to our knowledge, what people know (or do not know), their abilities (or lack of), and the stage in the development of the health condition and/or treatment, have not been taken into account altogether when creating and evaluating such products.

Consolvo et al [9] concentrated on the problem of obesity, a global epidemic, and its treatment, yet did not take into considerartion the physical and psychological conditions, abilities, and knowledge of their volunteers. Reynolds [32] took this concern a step further by pointing out that, despite the great contributions made so far by persuasive health-oriented games and their enthusiastic initial reviews, popular games like Wii Fit do not necessarily stand the test of time. Users' responses and opinions regarding Wii Fit changed from labeling it as "helpful" to qualifying it as "degrading/judgmental". This concern prompted us to wonder: "what went wrong?". After some research, looking at the abundant number of health-improving persuasive applications [9, 21, 25, 32, 49], we noticed that not many of them concentrate in stopping the health problem (even when possible) from occurring in the first place, with few examples [46]. That is, within the HCI community, we spend more time, money and effort treating symptoms from an existent health issue, rather than preventing it from happening. This of course is not the case of certain genetical or degenerative diseases, which have no known way to be successfully prevented. Looking for a way to tackle this issue, we found that research done by the Psychology community proved that prevention is viable [17, 47]. Thus, they advocate and support its implementation, whenever possible, thanks to promising recent results.

"How far along in treatment or in the development of a health condition is our future user?", "how does this 'stage' differ from other(s)?", and "how does it affect his or her interaction with our application?". These are some of the questionings we had to go through in order to come up with a wider approach to persuasive technology design, and after meditating on what Toscos [38] invited us to take into account, when his team depicted the complexity of type 1 Diabetes. That is, we took some time to reconsider our applications, to be more in-line with the current reality of our users and their physical, mental and sometimes even psychological conditions, abilities and limitations. To solve those issues, and to provide what we consider is a novel method to present and evaluate knowledge in games, we introduce Amigo, a Visual Novel with Multiple Composite Scenarios to prevent bad eating habits. Amigo was carefully designed taking into consideration the cultural implications of collectivist societies [31]. Visual Novels (VN) are a sub-genre of Adventure Games, a type of gaming popular in Japan, which is little by little entering the western market [4, 36, 45]. VN's popularity relies on attractive characters and stories. Unlike other forms of gaming, progress is obtained through personal or emotional growth and abilities to solve all kinds of puzzles and riddles, rather than through power/level increase [33].

Amigo was implemented on iPads and designed for the prevention of bad eating habits through Multiple

Composite Scenarios. Prevention, unlike common persuasion techniques used in the HCI community, is particularly aimed at stopping/hindering the development or progression (including the origins) of a health condition. It implies three steps: to persuade, to educate and involve. The use of Multiple Composite Scenarios (MCS) enabled us to prevent by displaying recommended content on nutrition, depicting the treatment and consequences of bad eating habits, by involving the player in his or her own virtual treatment, and consequently persuading. Predictors for successful prevention and/or recovery from eating disorders, for our case anorexia nervosa, include: A) the learning of the value of food and a good nutrition, and B) the addressing of the misconceptions on self-worth based on the ideals imposed by the self and others [16]. We based the treatment presented through the Multiple Composite Scenarios (MCS) following the parameters and predictors suggested by Arthur-Cameselle and Granek [1, 16]. Games are composed of interactive, visual and narrative elements, and we persuaded using each of them. This was possible thanks to regulatory fit through narrative engagement, affect framing of messages and story presentation with coping/fear techniques [1, 14, 39, 42, 43, 48]. With those three elements, we managed to retain user interest while preventing and expanding from the original goal.

We created the Multiple Composite Scenarios (MCS) inspired by the three step method from Unconscious Thought Theory (UTT), an approach that to our knowledge has never been used in HCI applications [3, 6, 19, 45]. The novelty of our approach relies in the special care we gave to detail, as we tried to take advantage of the common narrative, multimedia and interactive aspects of Visual Novels. Our Multiple Composite Scenarios, serve to depict the different stages normal to an affliction (considering treatment, decay and/or recovery), namely Anorexia Nervosa, act as various opportunities for contextualized informed decision making, provide opportunities for reflection on recently learned information, and represent a structured method for goal increase with Visual Novels, which require a multi-branching story.

Amigo is an interactive Visual Novel for Prevention (VNP), that narrates a fantasy-mystery story: a new student must choose between supporting the defenders of earth, solving a mysterious crime and helping them defeat the invaders from an alternate reality or join run away. Visual Novels with Multiple Composite Scenarios for Prevention contribute to the HCI community in that we incorporate novel methodologies and gaming techniques, provide an opportunity for longer term use of games, and virtually "adapt" to the progression in the treatment/deterioration of a health condition. We evaluated our tool in a two-session experiment, dividing participants in treatment and control conditions, to validate the efficacy of our approach. We did so with multiple qualitative set of instruments including performance on-game, interviews, questionnaires and surveys. We managed to measure empathy, knowledge, response to requests, intention to diet and quality of nutrition following validated methodologies, and used techniques of grounded theory to analyze our results [8].We discuss our findings, present our limitations and conclusions, and we also show the scope for our future work.

In the "Background" section, a clearer and easy-to-follow description of the elements necessary to understand our approach to Prevention as well as the Multiple Composite Scenarios (MCS) is presented. On it, we elaborate on the aspects necessary to start preventing. On chapter 3 "Multiple Composite Scenarios (MCS)" we show the steps required to implement our method, with practical examples. Chapter 4 "Amigo" contains a full description of our application, to help the reader get a better picture on the gameplay. The "Implementation" chapter has an explanation of the pseudo-code of the game, and a sample of the code used. "Evaluation" encloses materials, methodology, application, results and findings of our experiments. And lastly, on "Conclusions & Future Work" we resume our contributions and expand on the path we intend to take with our approach.

Chapter 2

Background

When our project started, we were looking for a novel way to avoid rejection to persuasion in games. We wanted to learn how users would react to a persuasive game with a high degree of freedom, by having both narrative and persuasion related tasks. In order to do so we chose Visual Novels (VN), a sub-genre from Adventure Games (AG) born in late 80s in Japan, with attractive characters and stories [33]. VN have a strong story arch, which grows along the path determined by the actions and feedback of the player during the game. Thanks to their multi-branch tree story structure, it allowed us to include the purpose of persuasion within the context of the game. Our goal was to prevent the development of poor eating habits in young japanese students through the story, visual and interactive elements in a game. We were able to do so through narrative engagement by regulatory fit, coping/fear appeals, and affect framed health dialogues [42, 43, 48]. We also made our game culturally conscious, by adapting our designs to a collectivist society like Japan using stories and characters proper of japanese animation [31].

However, after making a deeper analysis we asked ourselves: "how can we increase persuasion, keep a high degree of freedom, and maintain the health goal 'behind the curtain' to avoid rejection?", that is, how could we encourage our players to use our persuasive game for more than a couple of times without recurring to repetitive tasks?. Through our multiple consults to Psychology journals, we found the Unconscious Thought Theory. The UTT contemplates a 'distraction' to occur in-between tests of persuasion, allowing us to avoid rejection and insert the 'fun' [3, 6, 19, 45]. Toscos et al emphasized how one very specific type of diabetes has so many implications, which prompted us to wonder "how could we profit from depicting the progress of deterioration or recovery of a health condition in a game?", to mimic the reality of our players [38]. And after meditating on a mid-term analysis done to Wii Fit, we noticed that, stages in the evolution of a health condition, could be an important factor that affects opinion, enjoyment, needs and overall performance of the players when using health enhancing applications [32]. With all these implications, we embarked to a new destination: preventing bad eating habits in young japanese students. Specifics on UTT, MCS, among others are described next.

2.1   Prevention

"What is prevention?", "how does it work?", and more importantly, "how could we start preventing with our game?". Prevention, in health, can be defined as the multiple strategies taken to reduce the risk of developing a particular sickness, or to hinder its progression [15, 47]. Unlike common approach to health by persuasion of behavioral change, which deals mostly if not solely with complications, prevention makes use of negative/positive reinforcement (a technique common to persuasion), education and involvement to tackle the origin and misconceptions of an issue in an aim to truncate its development. The use of persuasion and education in order to prevent is not something new. Withers et al showed one clear example, in which, with the use of contextually framed health recommendations, young students improved both their knowledge on

the topic and intention to diet [47]. Psychologists have proven that the success of prevention, depends on user involvement with the learning/treatment process. Thus, from our research, we were able to extrapolate three basic requirements to prevent: 1) persuade, 2) educate and 3) involve (fig. 2.1). For the scope of this work, we concentrate on the benefits to persuasion of our approach. We do, however, intend to study the implications to educative technology of our method in the future.

Figure 2.1: To prevent one needs to: persuade, educate and involve.

Preventing a health condition with the use of technology, was first suggested by Winchester, yet no specific methodology was appointed or tested by him [46]. To our knowledge, prevention through persuasion in a game remains an unexplored land. We believe that contributing to cutting a problem from the root, or at least to try to help stop its progression, represents a viable way to avoid future complications. Based on this tree analogy (fig. 2.2): a health condition has roots (origin), stem (progression) and leafs (complications). With this image on mind it is easier to understand our take on the treatment. Like other persuasion applications, we too deal with the complications of a problem, however, we make our best effort to address also the misconceptions and predicaments due to the origin and progression of the condition itself. Therefore, to prevent, we persuade, educate and involve our player. Persuasion aims to encourage users to adopt a good behavior, and to abandon bad habits, through constant positive/negative reinforcement. Education occurs as we advocate informed decision making, that is, we provide in our game useful content later required to solve puzzles and tasks, which also serves as a parameter to measure learning. And last, in our approach, involvement consists in making the player part of the support group for his or her own virtual friend's health issue, by giving him or her rewards for contributing to treatment adherence of their new friend. More on the dynamics of the game, and the particular way in which we prevent is presented on next sections.

2.2 Our approach to eating disorders

Eating disorders refers to a persistent and/or severe disturbance, of regular eating habits, that results in impaired physical health or psychosocial functioning, and is not due to a medical or psychiatric condition [13]. Known disorders include anorexia, obesity, bulimia and binge eating. For our experiment the main characters of the game were used to depict a poorly treated case of anemia, which results in an anorexia nervosa. Two features that need to be present to make a diagnosis are: attitudes towards shape/weight in which self-worth is judged almost exclusively based on physical appearance, and the active maintenance of low body weight, achieved and maintained through diet, excessive exercising, and in some cases vomiting [13].

In anorexia, over-evaluation of shape and weight, results in a pursuit of thinness and weight loss. Food eaten is limited, avoiding those foods seen as fattening. Concerns about figure, lead to various forms of checking, including frequent weighing, self scrutiny, body pinching and measurement of body parts [13]. People who suffer from these disorders, present depression, anxiety, lability of mood, irritability, low self-esteem and obsessional thoughts and acts [1, 10, 13]. Suicidal thoughts are not uncommon, and about one-third result in
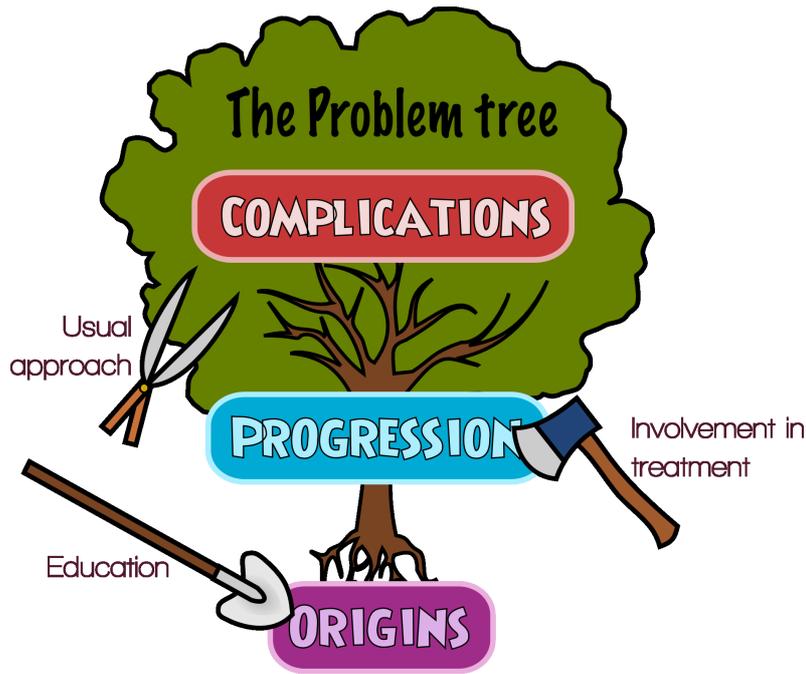
Figure 2.2: Our understanding of the problem tree.

the death of the patient [10]. Personality characteristics include perfectionism, steadfast determination and persistence in trying to achieve personal goals, with a tendency to be inflexible [13]. Predisposing factors include exposure to a social environment that encourages dieting, and social or occupational pressure to diet, like participating in sports or activities in which shape or weight are important [1]. The most effective treatment is cognitive behavior therapy [1, 13]. And antidepressant drugs are the only pharmacological substances which have shown positive results [13].

Full recovery in most cases, according to Lamoureux [22], may take up to 10 years, with variable and unpredicted courses which complicate treatment. Patients may constantly be hospitalized, and take part of individual, group or complementary therapy. Redefinition and understanding of the self, specially through reflection on their condition, has been shown to benefit their recovery process [16, 22]. Trust, particularly learning to trust others and themselves, has also been reported as crucial to treatment adherence. Gaining perspective, challenging "wrong thinking", that is, by changing patient's misconceptions on food, nutrition, their bodies and self-steem is also at the center for recovery [22]. In challenging these distorted thoughts, a person's perspectives on concepts like food and weight, may adapt towards the desired behavior. Balancing attention, while on treatment, between therapy and distraction also favors recovery. Particularly in the prevention of anorexia, as Granek suggests, by stepping back and analyzing their condition from another perspective, an anorexia patient may rediscover a new sense of self, one in which self-worth is not determined by weight or looks [16, 22].

As figure 2.3 shows, in our game, to persuade users to adopt a healthy attitude, we depicted the deterioration (or recovery) process of a poorly treated condition. That is, if the player followed treatment, improvements would be shown, or the character would decay otherwise. By doing so, we sought to reflect the life of a character, similar to what the player him- or herself may be going through, as he or she may identify with the stages in a more personal level. This division into stages also helped us determine an easy way to let the user know how he or she was performing, as if played correctly, the health of the character may be successfully restored. Correct depiction may vary among health issues, yet, some may share similarities. To increase the veracity of our approach, we based our representation of recovery and deterioration on-game based in the examples depicted on [16, 22].
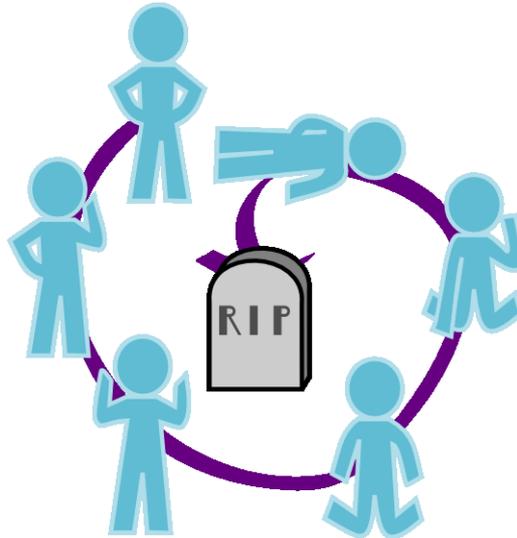
Figure 2.3: Deterioration cycle of a poorly treated health condition.

2.2.1 Preventing anorexia

Previously we mentioned that, in order to prevent, one has to persuade, educate and involve. Also, we elaborated on the key factors found to help treatment adherence and full recovery: nutrition learning and self-worth reassessing. Following our purpose, to prevent an eating disorder, namely anorexia in young students, we decided to find a specific case which we could present. The case had to be entertaining, as our application is a game, and also manageable as we had to find a way to present it. Along this quest for possible cases, we found the treatment for anorexia in young college athletes. Athletes are commonly exposed to a socio-cultural pressure to be thin and to fit a stereotypical body-type for their sport [1]. There are a variety of risks that contribute to the development of anorexia in athletes, including: genetics, socio-cultural ideals, familial interactions, trauma and personality [1].

As Arthur-Cameselle et al suggest, the treatment and recovery of the eating disorder in young athletes contemplates the following requirements (predictors of success): 1) to become educated on the issue to increase awareness, 2) to emphasize importance of proper nutrition, 3) to move emphasis from body weight to skill or capabilities, 4) to avoid singling out body differences, 5) to be honest about the personal condition, 6) to look for emotional support, 7) to avoid participation in complicated tasks if health risks are evident, 8) to constantly address reasons why one would not continue with treatment, 9) to determine the underlying cause of and triggers for the disorder, 10) to focus on the benefits, 11) to put life into perspective and 12) to reach out to important others in life for emotional support [1]. These predictors can be summed up in two aspects: A) to address misconceptions on food and learn about nutrition, and B) to redefine self-worth in the eyes of the self and others, all with the help of support groups.

2.3 Unconscious Thought Theory (UTT)

Current research has proven that individuals can think about complex information, output sound judgements and be persuaded, even after a distraction takes place [19]. Simple stimuli, even when not focal to conscious processing, can influence individual's attitudes, goals and judgements, thanks to what is referred to as the deliberation-without-attention effect [6, 19, 45]. This 'distraction' allows for attitudes towards a strong message to become more favorable, thanks to unconscious thinking. Forming an impression works in a bottom-up fashion, meaning that unconscious thinkers form such impression unbiased by stereotypes [6]. UTT contemplates a minimum 3 minute wait (approx.) after giving a message, to allow for unconscious

thought to occur. It is this time of 'distraction' that enables us to present seemingly unrelated topics, namely the game narrative, and still be able to achieve the goal of persuasion.

This characteristic also benefits health related topic presentation, as players may be introduced to important information without evoking feelings of rejection. Unconscious thinking benefits the process of decision making, even when being presented with a new topic, as Waroquier affirms, as too much deliberation may deteriorate a first impression [45]. Limitations to UTT are related to its goal-directed process, as it can be obstructed if a decision goal has already been fulfilled. That is, unconscious thinking may not be able to change a conception once a conscious determination has been made. And quality of decisions taken with an unconscious process may be lower, in certain cases, than those of conscious thinking [3, 45]. To our knowledge, the UTT method remains unused by the HCI community.
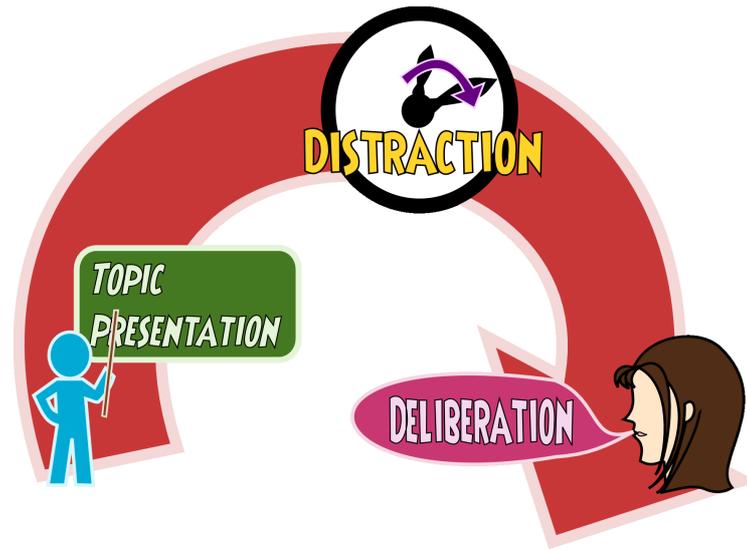

Figure 2.4: Three basic steps of the Unconscious Thought Theory.

2.3.1 Creating a model to prevent

UTT serves our purposes of persuading while maintaining an apparent high degree of freedom, as after persuasion comes a moment of fun, prior to decision or judgement making. The basic process to apply UTT, as can be seen in figure 2.4, is composed of: 1) topic presentation, 2) distraction and 3) deliberation. With a minimum of 3 minutes to distract, we are able to continue with the narrative of the game without disturbing the persuasion process. To assess that prevention had occurred, we made an adaptation of Withers 5 topic presentation method [47]. His method consists in showing 5 different 'topics' related to eating disorders to participants, context framed, then measuring their knowledge on the issue. With the UTT persuasion-distraction pattern, we showed 5 concepts of nutrition to the players using what we call Multiple Composite Scenarios (MCS). MCS consist of distracting users by continuing with the narrative of the story, and give them the opportunity to deliberate by testing their knowledge on puzzles, and/or by making good choices in a virtual store. MCS are described in depth in the next section.

2.4 Our approach to persuasion

As previously mentioned, to prevent one needs to persuade, educate and involve. For our approach, we concentrated on the part of persuasion. We decided to prevent using the Unconscious Thought Theory's three steps: a) presentation, b) distraction and c) deliberation. To take advantage of all the elements in a game, visual, narrative and interactive, we sought to persuade with the three of them. In order to do so, we

read psychology and behavioral science journals to see what techniques could serve our purposes. We found narrative engagement through regulatory fit for the story, affect framing of messages for the dialogues, and coping/fear techniques for the interactive options in the game, as can be appreciated on figure 2.5 [42, 43, 48].
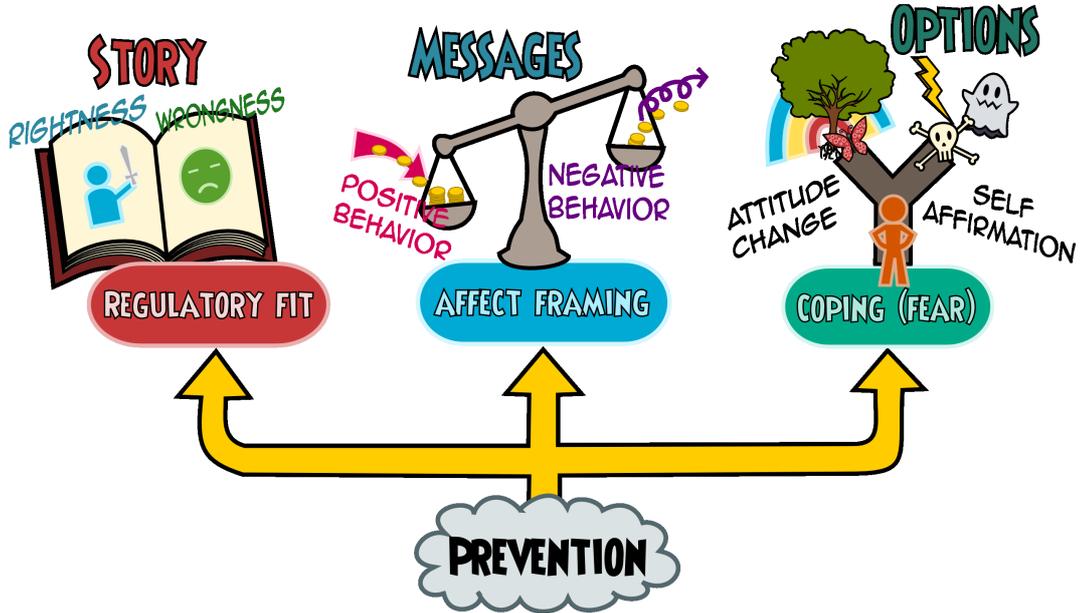

Figure 2.5: Using persuasion techniques to prevent.

Regulatory fit consists in shaping, through the narrative, situations that transmit to the reader a sense of rightness whenever a good behavior is sketched, and of wrongness related to a bad behavior [43]. That is, every time the main character does something that points towards the desired behavior, the story has a positive outcome, or negative otherwise, like the difference in paths that sleeping early on night before an important match or going out all night instead would represent. Affect framing consists in presenting through dialogues, as gains, all information or concepts related to the positive behavior, and as losses all messages that act in detriment of the ideal [42]. Which is translated into the depiction of health recommendations as being favorable for the player, and every negative message as loss. For example, an authority figure, like a Professor in the game, would introduce a new concept on nutrition in a clear easy understandable manner, while an enemy would suggest actions that could potentially hinder recovery. Coping or fear techniques are related to the natural response of our psyche to threatening situations. Coping refers to the adoption of alternate routes, like the adoption of a desired behavior, as opposed to adherence to self affirmation which may put oneself in danger [48]. That is, presenting to the participant two roads, one directed towards self-affirmation and bad results, and the other headed towards behavioral change and a good result. This form of conditioning would motivate users to take the route of adaptation, as self-affirmation (undesired behavior) represents a risk.

2.5 Visual Novels

The premise of Visual Novels (VN) is to submerge the user in a complex narrative, allowing him or her to decide possible outcomes and the path the story takes at will, as opposed to moving around in a virtual environment and following a single-line story. Like in text novels, genres vary from fantasy to love, suspense to history, among others. VN allow the user to make decisions, respond to or ask questions, and choose the action or path to take at will. They are story-driven, and character development follows literary conventions of personal and emotional growth, instead of level upgrade [4, 33]. Players interact with characters by choosing from pre-written options in a menu. Every action triggers a response. Conversing reveals clues

about how to solve a puzzle, continue through the story, disclose secrets, and may provide hints for future cooperation. High scores provide secondary goals, and serve as indicators of progression [4, 33, 36].
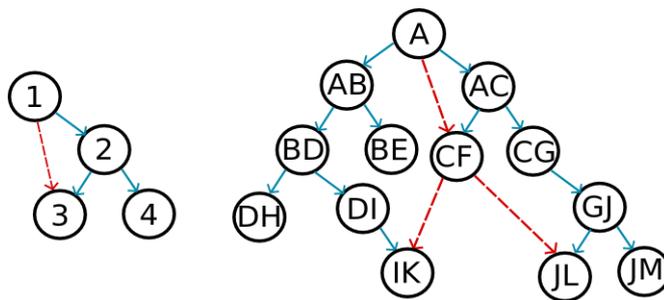
Figure 2.6: From single to multiple branching.

VN revolve around the central theme of relationships. Multiple branching story-lines, as opposed to single-ended storylines which look like directed graphs, are used to achieve different endings in a quest to allow freedom of choice [4, 32, 36]. Each decision point, as can be seen on figure 2.6, allows the user to alter the course of action of events, which in turn may lead to alternative outcomes. Every path reveals certain aspects of the overall plot, yet, it is only after uncovering different paths and outcomes that the full story may be completely understood. VNs have three feature characteristics: narrative, puzzle solving and exploration. Puzzles in VN may be of inventory, dialogue-based, environmental, or non-contextual logic type, depending on their goal and connection to the story [33]. Progress may be reported using a point counter, providing incentives and awards, or by unfolding secret or alternative courses of action. Success and failure are determined by the ending that the user gets. Characters display emotions, have a personality, and offer things to the user, like drinks, meals, objects and other affordances related to the story, which we use to our advantage to make them reflect on the health issues [4, 36]. Goals are not necessarily related to the user, yet affect the characters and/or their environment.

Chapter 3

Multiple Composite Scenarios (MCS)

One of the main contributions of our approach, is the consideration of the different stages in the development of a health condition in our narrative and visual metaphors, to represent the recovery/deterioration of our virtual character. Instead of showing material related to the treatment at an assumed stage of a problem, we depict the 'normal' course of progression of a poorly treated affliction, to help the user identify on a personal level with the game. Following the conventional 'stages' of anorexia nervosa [1, 13, 16, 22], we created all visual elements for our main characters. Yet, to fulfill our objective to prevent, using the Unconscious Thought Theory (UTT) and our approach to persuasion, we envisioned the Multiple Composite Scenarios (MCS). MCS imitate life, given that even a person with anorexia, at primary or terminal stage of the problem, has a 'life' besides their condition. We did not want to assume every participant is at a terminal stage, instead, we tried to make a game that imitates the life of a person with anorexia, as even they enjoy going out, attend classes, work, etc. This goes in line with precepts and concerns of prevention, and the recommendations for the treatment and recovery of anorexia nervosa, which say that only highly motivated individuals are successfully persuaded to change their behavior, by giving our players a 'break' from their virtual suffering [15, 16, 22, 47].

3.1   Seven steps to prevent

MCS served us to present a topic, and to represent the life of a person with a health condition, close to what their daily routine is like. Some serious games have tried to allow their users to reflect in a topic by representing a particular real-life scenario, where the user meditates on a specific situation [21, 47]. However, to our knowledge, there are no serious games that seek to recreate the life of an unhealthy person in order to persuade. The concept of scenarios in games is not new, although these often refer to multiple perspectives from a same scene [20]. In our approach, a scenario is the depiction of a particular step in the prevention process, and they are multiple because, in order to introduce one single concept it took us seven steps. The Unconscious Thought Theory is a method that, to our knowledge, remains unused by the HCI community. Inspired by it, the basic elements of prevention, and our approach to persuasion, we envisioned 7 steps to prevent, divided into three subsections: 1) introduce, 2) depict and 3) inform for "presentation", 4) "distraction", and 5) evaluate, 6) reflect and 7) involve for "deliberation", as can be appreciated on figure 3.1.

    Our seven step approach consists in: 1) introducing the basic aspects of a health condition, 2) depicting deterioration or recovery due to treatment, 3) informing of easy-to-use gain-framed content transmitted through authority figures or loss-framed disinformation from deviant minorities, 4) distracting through the narrative of the game, 5) evaluating knowledge through puzzles and on-game tasks, 6) reflecting on recently learned topics by applying them in the virtual world, and 7) getting involved and gain points for contributing to the treatment. We implemented persuasion by using our interpretation of the UTT method's concept

of giving some time 'off' to relax. This translates into the addition of a time for distraction right after presenting a mind-numbing concept. In other words, to give players some time to relax. The recreation of the life of a person with a health condition, also serves multiple purposes: A) show the progression 'stages' of a person who does not take care of their problem, B) present positive information as gains, C) provide an opportunity to use the recently learnt concepts in a virtual world, and D) be able to disclose health related content without taking the user 'out' of the narrative.

Figure 3.1: The seven steps of the Multiple Composite Scenarios.

To further favor our approach to persuasion, we made use of the following elements at specific steps: 1) the visual representation of the progression of anorexia nervosa through the main characters in the step of "introduction", 2) the consequences of adherence or abandonment of treatment (recovery or deterioration) in the story through the step of "depiction", 3) gain-framed experts' recommendations through teachers and coaches or loss-framed unhealthy suggestions by enemies in the step of "information", 4) action, conversation with Non-Playing Characters (NPC) or self-meditation scenes on which the story progresses on the step of "distraction", 5) puzzles and interactive activities to evaluate knowledge on the step of "evaluation", 6) opportunities to use the recently learned knowledge and consider potential benefits or dangers of our own choices in the step of "reflection", and 7) a support net composed of friends and family to help the patient continue their recovery on the step of "involvement". Our MCS method helped us have the user reflect on an issue in more than one perspective.

3.2 Using MCS to prevent

In order to understand the steps, let us give some concrete examples. Suppose that one is willing to present the concept of proper hygiene to elementary school students, and one wishes to do so with the Multiple Composite Scenarios (MCS). First, one should decide what aspects are the ones that would be included. If

we chose to prevent stomach infections by transmitting the concept "how to and why to clean your hands after going to the bathroom and before eating", we would: 1) look for ways to "introduce" the specific topic (i.e. our main character has played baseball for hours and after going to the bathroom wants to eat some snacks), 2) "depict" the consequences of this bad decision, showing perhaps how infections through parasites occur and how these develop stomachaches, 3) "inform" through a Non-Playing Character (NPC) like a teacher or superior of the seriousness of infections, 4) "distract" the player by allowing him or her to choose the best way to get back home, 5) "evaluate" what the player learned by showing a puzzle in which the only way to kill parasites is by killing them with soap 'bombs', 6) give users a chance to "reflect" on the issue by depicting the worst case-scenarios of infections, and 7) "involve" the player by asking him or her to make requests to other virtual baseball players of washing their hands before eating.

Presenting a concept through MCS may seem complicated, as it implies multiple steps, however, through its creative approach to topic displaying, imagination and participation values may also be benefited. This is possible thanks to the fact that, as Linehan suggests, time-on-task is a major predictor of success in learning, that is, the amount of time spent in absorbing content, and as Belloti conveys, video-games share these virtues as they stimulate cognitive processes like reading, deductive and inductive reasoning, problem solving, and inference making [5, 24]. Thus, despite of its complexity, MCS have the potential to contribute to prevention in more than one way.

Another practical example would be, if we wanted to prevent young girls from getting pregnant, and we chose to do so by presenting "alternatives to pre-marital relationships" we would: 1) "introduce" the case of Ami a girl from highschool who is sexually active, 2) "depict" the dialogues and relationship with her boyfriend which lead her to get pregnant, 3) "inform" of the responsibilities that single mothers have, 4) "distract" by having the player talk to other characters on the game to learn about an event, 5) "evaluate" knowledge by using a catch-and-collect important items for babies puzzle, 6) have users "reflect" on the difficulties of adult life and the consequences of their actions like not being able to attend parties, and 7) "involve" them by asking them to convince other characters in the game of being cautious.

Chapter 4

Amigo

It is time now to introduce Amigo, our first finished Visual Novel for Prevention (VNP). We decided for a fantasy-mystery game after testing some preliminary plots with possible future test volunteers. Character and graphic design were inspired by conventions of participatory design [23, 44]. We created visual, narrative and interactive elements from scratch because we wanted to make our game as close to the users as possible, instead of assuming that our own taste would reflect theirs. We based all elements on the precepts, conditions, treatment, and predictors suggested by Arthur-Cameselle et al [1]. Amigo is spanish for friend. Becoming friends with the user is what allows us to have emotional involvement and create an atmosphere in his or her mind to facilitate persuasion through the means of likeability, trustworthiness, empathy, among others [7, 12, 18, 35].

4.1   Preventing with Amigo

Common treatment for anorexia nervosa has two goals: 1) teach to the patient how and what to eat, and 2) help them reconstruct their perceived self (image and esteem) through support groups [16, 39, 47]. Withers [47] showed that, by learning about nutrition and self-perception, anorexia in adolescent girls could be successfully prevented, and they were also persuaded to change their eating habits and start to diet. Treasure et al [39] conducted a medical study of the physical changes and complications that people with anorexia have, and showed how learning about proper nutrition contributes to recovery. Predictors to treatment adherence and recovery include the redefinition of self-worth value (by the self and others), as well as addressing misconceptions regarding food [16]. That is, to change the way in which we perceive ourselves, based on our self-imposed ideals and the opinions of others, and the way in which we relate to food. Thus, we can say that, in order to prevent anorexia in young students, we have to: A) teach about food and nutrition, and B) help the emotional needs of the patient to help them redefine their self worth/image.

To prevent, first we have to persuade users to have a healthier nutrition [15, 36]. We decided to use narrative engagement, affect in dialogues, and fear appeals [42, 43, 48]. We achieve narrative engagement through regulatory fit thanks to the strong story approach of Visual Novels (VN) [33]. We use affect in dialogues, by framing health positive attitudes as gains, and negative attitudes as losses [43]. And we go to the extremes, prompting coping techniques to teach about nutrition, convince our users that bad eating behaviors have some nasty consequences, and allow them to reflect on what they learn. That is, every action has a consequence, positive or negative. Coping techniques, consist in putting the user in threatening situations, to instigate danger control processes, which include the acceptance of a recommended strategy, and the change of maladaptive behavior [48]. Thus, we presented recommended content on nutrition, and depicted treatment and consequences of anorexia nervosa with our Multiple Composite Scenarios (MCS) [1, 13, 39].

Emotional needs of the patient were particularly addressed thanks to the intervention of the support

groups delimited by Arthur-Cameselle et al on in their description of the individuals related with the recovery and treatment of young athletes, namely: family, friends, professors, peers and coaches [1]. By establishing emotional relationships in the game, the user becomes part of the support nets, which in turn try to address the misconceptions regarding food, nutrition and the self-worth of the virtual patient (and the player), by making constant appeals. Professors and coaches would provide useful information, family and friends would request the player to take care of the character, and in order to win, the user had to help his or her virtual friend by making suggestions or giving supportive messages. The process to persuade and educate players on the value of nutrition, to redefine self-perception and involve them in the support groups with the Unconscious Thought Theory (UTT) can be better appreciated in the following explanation of the Multiple Composite Scenarios (MCS), where we highlight the role of the support groups and information in the steps and scenarios.

Following our MCS model, we decided to introduce players to 5 topics on nutrition, influenced by Wither et al's five topic presentation with pre-recorded videotapes [47]. We also included on the information step, content on recommended food categories for nutrition [39]. Trust, likeability and empathy played a mayor role in how characters would introduce such information, as we sought to emotionally involve the player in the process. Wither and his team consider that in order to prevent, first they have to teach a concept, persuade of its validity, and later evaluate knowledge. Our approach differs in that they use the Elaboration Likelihood Model, whereas we use MCS permeated by the Unconscious Thought Theory. That is, to prevent first we had to find a way to present the topic, distract while allowing for reflection, and evaluate without fully interrupting the flow of the narrative. With MCS we were able to show the negative aspects of a badly balanced diet, framed as losses, by having the main character make remarks on his or her bad decisions with messages like "I think I will skip a meal, I want to lose weight" [43].

We would also inform about food groups at class, having a virtual professor provide gain-framed related keywords (to give ideas to players of what to browse on the web if they want) and their benefits. We would have the player talk to the main character to pursue a narrative oriented goal, as a distraction. A main character may get sick and would be taken to the hospital, which would prompt the player to use coping strategies [48]. Puzzles like that of the nutritional pyramid would appear to evaluate what he or she had learned. We also had occasions to reflect, like applying knowledge at a virtual store, on which the player had to choose what to buy for a meal. And lastly, we gave them opportunities to get involved in treatment, by helping the family of the main character to keep an eye on him/her. That is, we exploited every aspect of persuasion in order to benefit our approach to prevention. More on how MCS works in Amigo is explained next.

4.1.1 Example of prevention with Amigo

For a better understanding of our approach to prevention with Amigo, let us describe a concrete example, using the parameters and methodology mentioned so far. To prevent means to persuade, educate and involve [1, 16]. Predictors of adherence to treatment, which ultimately lead to recovery, are: learning nutrition (education) and rediscovering self-worth (involvement). To persuade and exploit the visual, narrative and interactive elements common to our gaming style Visual Novels (VN), in our approach, we decided to use narrative engagement through regulatory fit for the story, affect framing of the dialogues and fear/coping techniques for the outcomes. To avoid creating a chocolate-covered broccoli, a tool that isn't fun nor useful as Linehan suggests, we decided to use the Unconscious Thought Theory (UTT), which enabled us to persuade, give a break without disrupting the narrative, and ask for a deliberation on what was recently said or taught [24, 45]. To present all these to the user in an orderly fashion, both for evaluation and easy comprehension, we came up with seven steps in what we call Multiple Composite Scenarios (MCS), which include: 1) introduce, 2) depict, 3) inform, 4) distract, 5) evaluate, 6) reflect and 7) involve.

The main character, an athlete who suffers anorexia nervosa, both likeable and trustworthy, would "introduce" his or her condition to the player. With dialogues like "Do I look fat? I would like to be fit

for the game" or "I would like to lose weight for the next match" the main character would introduce the player into his or her world. Once the user and main character become friends, the consequences of anorexia nervosa, like anemia, would be "depicted". After not eating properly for a couple of days, the main character would faint in front of the character, and would be taken to the hospital. This situation aims to show the severity of the condition. In every class and practice, following Arthur-Camiselle's suggestions, Non-Playing Characters (NPC) like Prof. Numazaki and Coach Ueda would "inform" the player about benefits of good nutrition, and risks of bad eating habits. "Today we will discuss the Nutritional Pyramid. Have you heard about it before?" said Prof. Numazaki, who would elaborate on the vitamins essential to a good diet. Players would be "distracted" by continuing the narrative of the game, to give the unconscious thinking process time to occur. With action, secret or simple dialogue scenes, the player would pursue narrative related goals, which would help maintain the entertainment.

Recently learned knowledge, regarding nutrition would be "evaluated" with the use of puzzles. These puzzles weren't only visual and interactive, but were also presented in the form of riddles in the dialogues, to make the user think, and to determine how much and how well he or she had learned the concepts on nutrition. Later, misconceptions on food would be addressed with opportunities to apply knowledge and "reflect" about nutrition at a virtual store. By removing the consequences from real-world actions, the player could freely choose from a list of groceries, to buy what is most convenient for him- or herself. And lastly, NPC like family and friends would discuss the problem of the patient with the user, and invite players to join support groups to take care of the main character. If he or she decides to join the support net, then messages to change misconceptions on appearance, and self-worth were made available. "You should take care of yourself", "If you eat more you would feel stronger", among others were the types of dialogues the player could use when meeting the main character.

4.2   Choosing the right story

Recapitulating the basics, to prevent we had to persuade, educate and involve. As was previously mentioned, we focused in the part of persuasion, without completely disregarding the other two. Therefore, if we wanted to prevent we had to choose a story which allowed us to: A) establish an atmosphere with which the player would be persuaded of accepting and implementing a good behavior, B) learn new content to address his or her misconceptions on a topic, and C) get involved with his or her own personal recovery. We also needed a story that could be used with the seven steps (introduce, depict, inform, distract, evaluate, reflect and involve) of our Multiple Composite Scenarios (MCS) method. And we preferably wanted a story which could fit the recommendations for successful recovery done by Arthur-Cameselle et al [1]. Following recommendations from Participatory Design, we conducted workshops with possible future end-users to create the visual, narrative and interactive elements of Amigo [44]. At first we considered all the possible genres that could be adapted to our goal of "prevent eating disorders in young japanese scholars". From horror to romance, we had to pick one that would be attractive and engaging to our audience.

Other stories may have a similar effect. However, we wanted to reflect the tastes of our users. To our knowledge there are no studies related to choosing the right story for a persuasive game, which prompted us to create a new one from scratch. After conducting a workshop with possible future players, using Participatory Design techniques, we can at least affirm that the narrative of Amigo is closely related to what our audience likes. Once the workshops took place, we had a concrete story with interesting main characters, young athletes with a case of anorexia, who "introduce" the health condition and "depict" its consequences, Non-Playing Characters (NPC) like professors and coaches to "inform" users on the benefits of nutrition and treatment, action scenes to "distract" them with the narrative of the game, puzzles to "evaluate" knowledge without taking fun out of the equation, a virtual world with opportunities to "reflect" on what was learned, and opportunities to get "involved" in the treatment of the virtual patient and become part of his or her support net. We chose a fantasy-mystery story in which, the defenders of earth, members of ancient clans,

were confronted by a defying group, who sought to take control over the magical realm and planet earth. Extracts from the story can be found in the following sections.

4.3   Story

Visual Novels' (VN) success can be thanked to their eye-catching characters, dramatic development and multiple-arch stories [4, 48]. In Amigo we introduce players to an alternative magical reality, which is under attack by a mysterious group, who after murdering a researcher, seek to gain control of two parallel universes, the magical world and our planet. Amigo is the story of a character, male or female, a new student at Ginga University, who just joined the Sakurada Campus. The game starts the first day of school, when the player is requested to attend to an international Professor's speech at the Memorial Hall. After the presentation, our player is witness to a strange murder. Gameplay starts with an interview to the user by Detective Takamiya. Narrative of Amigo may be appreciated in figure 4.1. To keep characters and situations credible, we depicted the life of four college athletes with anorexia, involved in the fantasy world. Athletes are exposed both to sociocultural pressure to be thin, and to fit a stereotypical body-type for their sport [1].

People with anorexia present high self-regulation, manifested as perfectionism and conscientious personality traits, with an attention to detail and the use of avoidance strategies to regulate emotions, characteristics displayed by our main characters, both boys and girls, trustworthy and likeable [7, 12, 35]. We provided multiple endings (bad, good, perfect and special), which could be achieved depending on the actions of the user during play. The existence of multiple endings is mentioned from the beginning, to motivate the user to play in more than one occasion. Secret options remain locked until the user responds in a particular way, or solves a puzzle in a specific manner. Achieving one ending or unlocking secrets is a definitive way to determine success or failure (in game and prevention).

4.4   Characters

Following the description of anorexia patients and the suggestions for treatment done by Arthur-Camiselle et al we designed the main characters of Amigo, to portray through them the necessary steps to recover from anorexia nervosa [1]. Haruko, Shou, Henri, and Momoka are their names, all suffer from anorexia nervosa, and constantly try to have the user join extra curricular activities and hang out. Haruko practices gymnastics, and lives a very stressful life. Shou practices baseball, and likes to go out every night. Henri is on the fencing team, and reads a lot. Momoka practices Aikido, and is very into fashion. Individuals who are more confident in their judgements have been found to be more influential in discussions, regardless of their actual task accuracy [12, 17, 35]. Main characters (fig. 4.2) show this quality, and present ideas in an openminded manner. Focus of the game relies on every character's version of the story. We sought to increase persuasion by having the user reflect on situations similar to the ones they have on their daily life, yet in an environment full of fantasy and possibilities, to motivate them to give a chance to our recommendations. During our Participatory Design workshops we made sure to create characters that would help us persuade and maintain user interest. The background, look and feel of our characters was also decided at workshops.

As stated previously, predictors to successful recovery of anorexia include learning about nutrition and the redefinition of the self, with the help of support groups [39]. To be perceived as trustworthy, a character would ask for accurate answers like "do you think I should skip a meal?", or for opinions like "should I drink water or soda?", which would have the player act in an openminded fashion [7, 17, 35]. To show our characters as likeable, we made them relate to the user, and ask for their impression on issues like "do I look fat?", also aiming at openminded thinking [12, 18]. Characters constantly provided information to address user's misconceptions, on eating disorders and nutrition. Allies or Non-playing Characters (NPC) were modeled to be authority figures, as an actual, imagined or implied mention to an influential person exerts influence over people [17]. For collectivist societies like Japan, personal reputation in the eyes of others,

Figure 4.1: Narrative of Amigo

Figure 4.2: Main characters of Amigo

concern for group's image, social losses and gains, seeking advice and guidance from significant others, and allowing external circumstances to determine behavior, play an important role [31]. Our main characters belong to well identified and interesting groups. People reject measures of change, if an idea is presented which could align them with a deviant minority source [48]. Thus, enemies show negative attitudes which could hinder the progress of the player, like asking players to contribute to weaken the hero.

4.5   The story of Haruko

"Today is my first day at Ginga University. I feel so excited. I hope I can meet many people, and that I can make many friends. First I will go to a conference, what will it be about? It is a good and sunny day!", these are the first words of the player, when starting the game, to establish the atmosphere of the narrative. At the first day of school, we meet Haruko, a girl with many secrets. Haruko is a true rebel. Ever since she started reading she had been attracted to foreign ideas. She is a stubborn girl willing to express herself through gymnastics, her "art". She loves freedom. Little do people know how important it is to her. Art and self expression are highly valued by her. An open minded idealist, yet very controlling. To her, gymnastics are her best way to show to the world who she is. Thus, she seeks to be the best in every competition.

After the murder of Prof. Kudchenko, the player is introduced to a story in which he or she is a suspect, meets Haruko an interesting yet mysterious person, and his or her conceptions of the world are constantly challenged. "Hello, my name is Haruko. I am a third year Architecture major student. Very nice to meet you!" says the young and preppy girl, "are you from town?, I am so happy to start classes.", she adds. Depending on what the user responds, a friendship may begin. Nevertheless, Haruko does her best at being friendly, "and, what do you like? do you have any hobbies?" she asks. "That is very interesting. I hope we can continue talking later." she responds before going to classes. Once in the classroom, the player meets Kaori, a Non-Playing Character (NPC) who happens to know him or her from Junior High School. She is also very nice, and constantly provides hints to solve mysteries or choose the right path in the story becoming a sort of sidekick. "Hi do you remember me? It's me Kaori, we used to be together in Junior High School." says Kaori, "What happened yesterday? Do you know?" she asks to the user. Based on what the player

responds, the conversation may be either revealing or simple. Either way, they get interrupted once classes start. When finishing, the user meets Haruko again, who continues the friendly conversation, inviting the player to join extra curricular activities, namely the club of Gymnastics.

Non-Playing Characters (NPC) have varied roles, and aim at presenting content without interrupting the flow of the story. Such is the case of Prof. Numazaki, a lecturer of one of the classes the player takes, who introduces topics relative to nutrition, or Coach Ueda, who helps all gymnasts to stay fit. "Did you know that low carbohydrates means that something may be healthy? Electrolytes are also very important." says Prof. Numazaki, "carbohydrates may be classified depending on the number of sugar they contain. They include rice, noodles, bread and other products." she adds. "If you want to be faster, you must stay fit. Sport drinks are good, however, natural or mineral water is also good." mentions Coach Ueda before practice, "Dietary minerals or macro-minerals are chemicals required by living organisms. The most important are Calcium (good for muscles and bones), Sodium (sea salt), Magnesium, Phosphorus, Potassium (bananas) and Sulfur (common in amino acids)." he writes on a board.

Enemies have one goal in mind: weaken the hero, in this case Haruko. By making constant appeals to the user which would align him or her with a deviant minority, two paths become available: A) join the good guys and accept behavioral change, or B) support the bad guys and pursue the reaffirmation of misconceptions. "Who are you? Why are you so close to Haruko?" says Haruna, a member of the evil clan. "I am Haruna Noguchi. You can join the dark side." she adds. Relatives of the main character, like Nami Murakami, constantly ask to the user to help them with the treatment of Haruko. NPC usually enter in the scene after the main character, Haruko, suffers a relapse in her treatment, like being taken to the hospital due to anemia induced weakness. "Thank you for bringing my baby sister to the Hospital. My name is Nami. Nice to meet you." says Nami at room of the hospital where Haruko was taken. In order to appeal to the emotions of the user, Nami makes comments like "she never eats. I am so worried for her.", and requests the help of the player with comments similar to "please, tell her to eat more if you may.".

Action scenes have the goal of advancing the narrative, as a distraction, without fully disrupting the Unconscious Thinking process. Unlike the style of other scenes in the game, we tried to replicate with them the look and feel of popular fantasy games. Obviously, we couldn't create a 3D or 2D animation sequences to show exciting battles, but we managed to engage our audience with text. "Who is that? That is a strange outfit. Unknown person performs MAGIC MP 100" appears on the screen. "What is going on? Is that Haruko?. Haruko performs MAGIC MP 100. Enemy performs MAGIC MP 150" says the next action scene. The magic world we envisioned is protected by four different families, from which each of the main characters are part of. Haruko is in charge of protecting the west gate to the alternate reality. However, given that she may or may not be strong, winning a duel depends on the cooperation of the user.

The story may conclude in one of four different endings (bad, good, perfect and special) depending on the secrets unlocked, involvement shown with the main character's treatment and recovery, points collected, battles won, etc. At the very last scene, Takarakuji the Dark Lord fights Haruko in a desperate attempt to defeat the four families. If the user had at least half of the total points, and unlocked half of the secrets, he would obtain the good ending. Perfect and special conditions were reserved to high performing players. The latter required that all secrets were unlocked. Bad ending was only displayed to those users who did not cooperate in 50% of the requests made by the characters of the game, and who showed no interest in getting involved in the treatment. In the bad outcome, the Dark Lord conquers earth, destroys both realities and begins his reign of terror.

4.6 Puzzles

Puzzles appear in different situations, from the conventional visual type, to enigmas the user had to solve. They were used to elevate the dramatic tension, served as a way to advance through the story, unlock secrets, determine where the user would be taken (story and/or location wise), and to evaluate knowledge

on a recently learned subject, as part of the Unconscious Thought Theory step of "deliberation". Figure 4.3 presents two puzzles, one used to evaluate the knowledge of players on nutrition, and the other is a representation of puzzles related only to the story. The nutritional pyramid puzzle consists in moving the right food group to its correct position, according to the content taught by Prof. Numazaki at class. If the user paid attention, he or she will be able to order them without trouble. The higher a food group is, the fewer amount from it should be consumed.

Our version of the pyramid is inspired on recommendations from the US Department of Agriculture[41]. The player could freely move the different food-group buttons inside the pyramid, and collocate each in a specific slot. With this drag-and-drop approach, we allowed the user to rearrange the location of every element until he or she felt comfortable with the answer. After the last button was moved, the success percentage would appear on screen and the game may be continued. We did not have a time-counter as we believe that adding extra pressure may affect performance. The second puzzle is the typical "choose one out of three" type in which, after getting familiarized with the symbology in the game, the player has to take one exit to escape from the enemy. The correct door leads to safety, the wrong one to another confrontation with the villain, and the last option would represent point loss.
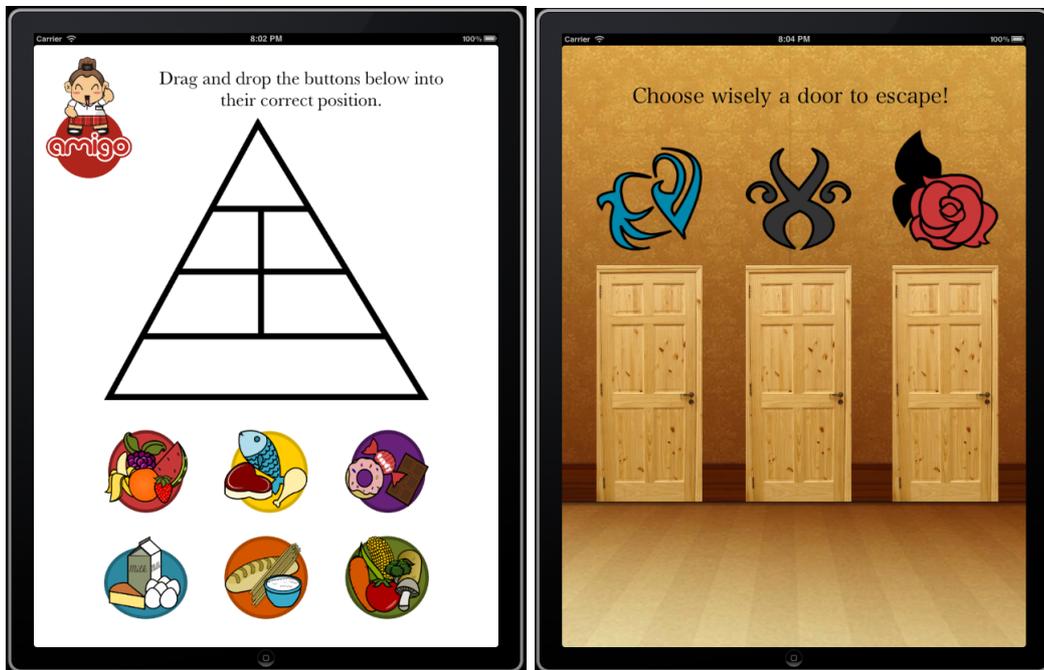
Figure 4.3: The puzzles

4.7   MCS in Amigo

To explain our implementation of MCS in Amigo, let us do so by describing the specific case of the Nutritional Pyramid. As a reminder, the requirements of prevention are to persuade, educate and involve. Predictors of adherence to treatment and recovery of anorexia nervosa are addressing misconceptions and misinformation on the value of food and nutrition, and the reconsideration of self-worth based on self-imposed values and others. That is, to learn about nutrition and change the way we see and think about ourselves. And the seven steps of MCS are: 1) introduce, 2) depict, 3) inform, 4) distract, 5) evaluate, 6) reflect and 7) involve. We made use of all the multimedia resources at our disposition to benefit each step. Figures 4.4 to 4.7 illustrate the visual, narrative and interactive components that we used in order to present to the user our Multiple Composite Scenarios (MCS).

As can be seen on figure 4.4, first we "introduced" a specific case of the health condition of the main character which could clearly be benefited by the knowledge of the Nutritional Pyramid, namely anemia, a common condition of anorexia patients. Young athletes with anorexia are exposed to a socio-cultural pressure to be thin, and to fit a stereotypical body-type for their sport [1]. Whenever the athlete's body fails to match the norm, dissonance may occur, which results in a decision to diet, as they are lead to scrutinize slight differences in appearance. Our character is presented as a sports person, a high performing athlete who is part of a sports club. He or she is constantly practicing and forced to maintain a certain weight/look. A dialogue bubble, with affect framed messages, a menu containing 4 possible responses and an option to log-off were made available.
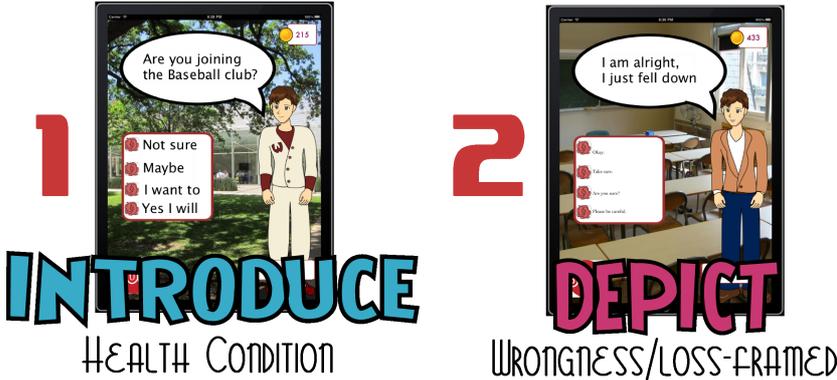

Figure 4.4: The first two steps in the implementation of MCS with Amigo

Next, as the second step contemplates, we would "depict" the consequences of anemia, using loss-framed dialogues and transmitting a sense of wrongness. That is, we would show how a poorly treated case of anorexia, specifically through anemia, deteriorates the health of an individual. It should be noted that a step in MCS was not necessarily completed in one single scene, and that we used various scenes/views to avoid making the game too fast paced. For example, in order to introduce a health condition and depict its consequences, we created a dialogue sequence through which we could transmit to the player the bigger picture. Unlike other games, we did not have a narrator. Therefore, story progression itself depended on the conversations that the user had with the characters in the game. As we had different looks per main character, we could move a scene from one side of the University campus to other, to benefit storytelling.
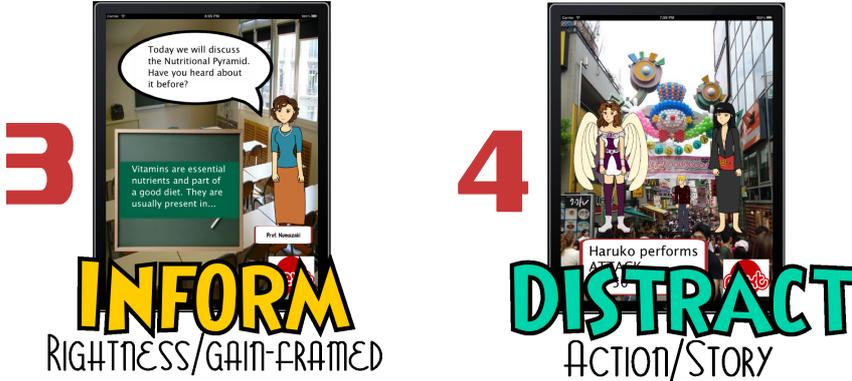
Figure 4.5: The next two steps in the implementation of MCS with Amigo

Later we would "inform" the user, with gain-framed recommendations and transmitting a sense of rightness, of the benefits and uses of the Nutritional Pyramid, including keywords and content that would be evaluated later. This process can be appreciated in figure 4.5. For this case, Prof. Numazaki would explain

the different food groups which constitute the Nutritional Pyramid, along with information on quantities and calories. The dialogue bubble, meant to represent the speech done by Prof. Numazaki, contained a brief summary of the concepts, while the green board included keywords and phrases that could be later consulted by the player, and which were lated to be evaluated. After that we would offer a "distraction" by continuing with the narrative of the game, using an action, secret or self-talk scene. This time-off would also serve as a way to avoid making the game purpose solely about persuasion. Step 4 in figure 4.5 presents a fight between the main character Haruko and her counterpart. If the player has given good advice, the Hit-Power (HP) of Haruko will be superior than that of her enemy. However, if the user has not paid attention, or is not helping Haruko she may end up losing the battle.
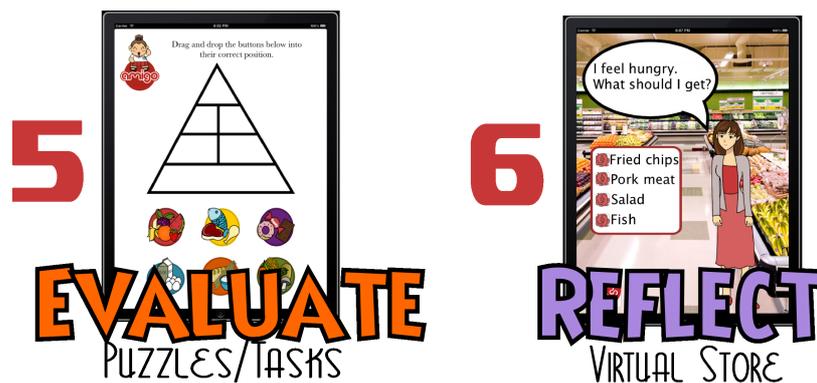

Figure 4.6: Steps five and six in the implementation of MCS with Amigo

Once the minimum of 3 minutes that the Unconscious Thought Theory requires was over, the next step was to "evaluate", with puzzles designed to be visual and interactive representations of the content taught at class. On the image we can appreciate how an interactive Nutritional Pyramid was made available, figure 4.6. The goal was to order the food groups according to suggested ingestion, that is, based on the amount of each that is recommended for consumption. Every food group was a movable button, which could be dragged and dropped to its correct position, and after collocating each in a space within the pyramid performance was evaluated. During game, some students did not get the functioning of the puzzle until after moving the first button. Nevertheless, all of them managed to score more than 50 out of a 100 points. Following that, we would give players an opportunity to "reflect" at a virtual store, by giving them the chance to buy food/drinks based on what they learned. We had a total of 5 virtual stores, each representing a different type, from the typical convenience store located at the corner of your street to the big supermarkets. Either way, we tried to present players with multiple products to buy always related with the content learned that day at University.

And lastly, we would encourage users to get "involved" by presenting situations in which Non-Playing Characters (NPC), like the family of the main character or friends, would ask for help to keep the patient in-line with treatment, as appears in figure 4.7. Relatives of the main character would appear more in the narrative depending if the day before the final game or event was approaching. Secret paths were made available to those who showed most interest towards the NPC requests, specially in those related to keeping an eye on the recovering main character. Common NPC dialogues were "Have you seen [character]?, he/she has not eaten in a long time, if you meet please ask him/her to have something for lunch!". Originally we intended to have a different type of music theme per character in the game. That is, one for the main character, other for the NPC, one for the enemies and a special one for action scenes. However, this was not possible as we could not predict how long it would take every player to reach a specific part in the story. We had then one common theme for main characters and NPC, and special ones only for enemies and action scenes. Figure 4.7 shows how a gain-framed appeal by the relative or friend, and special points were given if the user agreed to get involved in the treatment.

Figure 4.7: The last step in the implementation of MCS with Amigo

Let us recapitulate. The benefits of our seven steps (introduce, depict, inform, distract, evaluate, reflect and involve), which are also the requirements for successful recovery were nutrition learning and self-worth reassessing. These were distributed within the narrative of the game, and presented throughout the different game scenarios using interactive menus and buttons. We managed to persuade, educate and involve participants following our "5 topics to prevent" plan. With the organization of the seven steps, we were also capable to establish multiple parameters for evaluation, as performance could be estimated differently according to each. For example, attachment to treatment, empathy shown towards characters, response to appeals done by NPCs, battles won, groceries chosen at the virtual markets, etc.

Figure 4.8: Regulatory fit in Amigo

4.8 How does persuasion take place?

To understand how prevention occurs, after covering the seven steps of our Multiple Composite Scenarios (MCS), let us take a look at the inner workings of prevention. As we discussed before, to prevent one has to persuade, educate and involve. Given that our main interest was to study prevention through persuasion, in this subsection we analyze to more detail how regulatory fit, affect framing and coping techniques work [42, 43, 48]. Regulatory fit, as can be appreciated on 4.8, consists in transmitting feelings of rightness if behavioral change was selected by the user, and wrongness otherwise [43]. For example, whenever a character made requests that could favor/risk the health of the patient, asked questions regarding appearance, or maintained a conversation with the player asking for food suggestions, if the user 'helped' the patient, the next scene would be one in which his or her friend would show signs of recovery. Nevertheless, if the player chose options that contradicted health prescriptions or provided bad advice, then the next scene would be a

negative one. This goes in line with the prescribed treatment of anorexia nervosa, which contemplates the questioning of misconceptions, and the ideals for the support net which is meant to help the patient stick to treatment [22]. Figure 4.8 presents a case in which a negative outcome is obtained after giving a bad suggestion.

Figure 4.9: Affect framing in Amigo

When fighting the enemy, if the health of the main character was not benefitted then he or she would be defeated. Affect framing, can be divided into two paths: presenting as gains all information related to the good behavior, and as loss the bad behavior [42]. Treatment in a condition like anorexia nervosa also contemplates a learning process, aimed at informing the patient of the benefits of nutrition [39]. Some researches advocate that in order to fully recover from an eating disorder, a new diet must replace the old one. Therefore, we sought to teach the basics of a good nutrition, based in the recommendations by the US Department of Agriculture, among other sources [39, 41]. On figure 4.9 we have the coach and relative, both Non-Playing Characters (NPC), "inform" about the recommendations to keep a good nutrition and asking the player to get "involved" in the support-net respectively. Dialogues like "In order to be faster you have to rehydrate your body. Water is one of the most important nutrients in sports because..." before an important match, or "He barely eats, if you can, please ask him to eat something" after being taken to the hospital, helped us to provide a specific context to allow for reflection.

Figure 4.10: Coping techniques in Amigo

Coping techniques, fig. 4.10, may be expressed as the adoption of alternate routes, whenever adherence to self-affirmation may result in danger [48]. That is, we present a situation in which only two paths are possible: one which would represent a self-affirmation (maladaptive behavior) and leads to a bad result, and other which contemplates behavioral change and a good end. On figure 4.10 we present two scenes, one in

which the player may select what to buy at a virtual store, allowing for contextualized "reflection" on a subject. However, whether his/her decisions were good or bad, these will affect the performance of the main character. For example the user may help his or her friend to get prepared before the final confrontation against the villains. Given that the premise of the game is to help the main character be strong to defeat the evil group, coping techniques are evoked constantly. Therefore, we make the player the drama manager, and also enable them to decide what end they wish to see: by accepting or rejecting persuasion.

4.9   Summary

Our intention was to take advantage of the visual, narrative and interactive elements present in Visual Novels to prevent. We did so as we believe that each one of them (visual, narrative and interactive) can potentially benefit the goal of preventing while entertaining. Pacing and balancing of the persuasion material with the narrative of the game was achieved through the Unconscious Thought Theory scheme of "distracting after informing". And the Multiple Composite Scenarios (MCS) helped us introduce the content on nutrition in an orderly fashion. MCS also enabled us to contextualize the presentation of information in a way in which it allowed for both reflection and a better understanding, as we moved emphasis from what is presented to how. By following the predictors of successful recovery from anorexia nervosa, learning nutrition and changing misconceptions on self-worth, we sought to increase the degree of persuasion, learning and involvement. The case of the nutritional pyramid may not have been as enjoyable, interesting or engaging to players if presented with text. Thus, thanks to our Visual Novel (VN) gaming style and the Multiple Composite Scenarios (MCS) for prevention method we managed to cover the three requirements for prevention (persuade, educate and involve) while entertaining players.

Chapter 5

Implementation

For Amigo we decided to work on iPads, as we consider that they offer three beneficial feature characteristics: a) mobility, b) accessibility and c) interactivity. Mobility because one may take the gadget to any location, and use it in almost any position one may consider comfortable. By accessibility we mean their capacity to connect through WiFi, 3G, or other technology to the web. And with interactivity we refer to their multiple sensors that allow for different forms of feedback, like touch-screen, camera, motion controller, among others. These features enabled us to create an interactive version for our Visual Novels for Prevention (VNP) with which we could aim for goal expansion. We made use of original cartoon characters, free photographies and BGM available online, and a database for dialogues. Topics of persuasion were always related to narration, and never aimed at pressuring/influencing the player to take a specific course of action, as the user is at all times the drama manager. Figure 5.1 depicts the system's architecture. Without game and multimedia characteristics, Multiple Composite Scenarios, and prevention goal, Amigo could be compared to an interactive narrative with changeable goal [2].
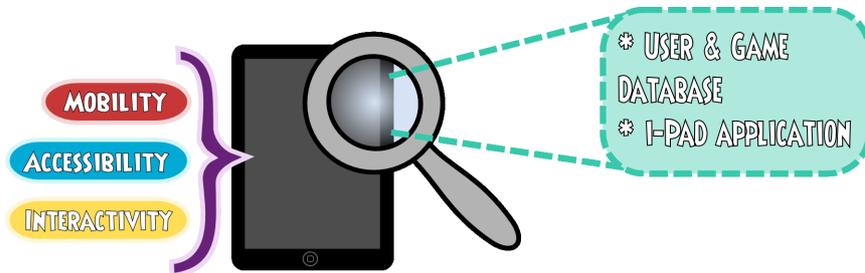
Figure 5.1: Basics of our application

As for the software of Amigo, it was created using ObjectiveC, C++ and SQLite3. We had multiple classes and event handlers with which we distributed the actions. Figure 5.2 is a representation of the inner workings of our application. Every event (feedback from user) was directly transmitted to the event handler, which would contact the narrative manager, a set of interconnected classes ruled by the story container, which in turn, following the script, would order the action director to display the correct scene on the screen. Given that VNP use multibranching stories, the minimum change in course would take the user into different destinations. Therefore, we spent a long time trying to set up the story container, as we wanted to avoid hard-to-follow or non-sensical outcomes.
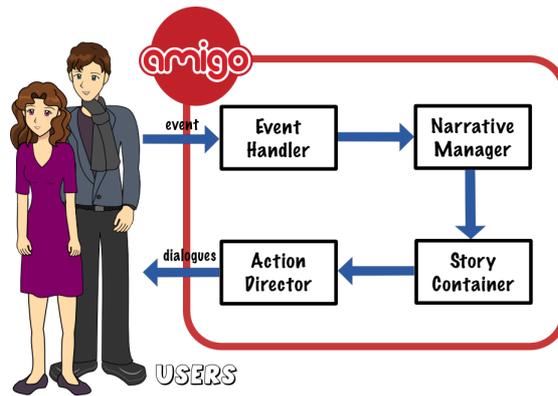
Figure 5.2: Software architecture of Amigo

5.1 The pseudo-code of Amigo

The following pseudocode, is an example of the general functionalities of Amigo for the Conversation scenes. With it, we aim at depicting the logic behind one of the Views of the application. Unlike other programming languages, ObjectiveC, works with Views, which are displayed on the devices. These serve as layers which can be removed, changed, allocated or deleted from the View manager. Specific functionalities vary according to the View type they are supposed to be displayed on, nevertheless share similarities which can be appreciated on following the code.

```
if event−handler==TRUE then {
        switch(character) {
                case 1: {
                        if (option == 1) {
                                background.hidden = NO;
                                dialogueLabel.text = databaseString(option);
                                optionALabel.text = databaseStringA(option);
                                ...
                                optionDLabel.text = databaseStringD(option);
                        }
                        ...
                        if (option == 4) {
                                background.hidden = NO;
                                dialogueLabel.text = databaseString(option);
                                optionALabel.text = databaseStringA(option);
                                ...
                                optionDLabel.text = databaseStringD(option);
                        }
                }
                ...
                case 4: {
                        if (option == 1) {
                                background.hidden = NO;
                                dialogueLabel.text = databaseString(option);
                                optionALabel.text = databaseStringA(option);
                                ...
                                optionDLabel.text = databaseStringD(option);
```

```
                                }
                                . . .
                                if ( option == 4) {
                                        background . hidden = NO;
                                        dialogueLabel . text = databaseString ( option );
                                        optionALabel . text = databaseStringA ( option );
                                        . . .
                                        optionDLabel . text = databaseStringD ( option );
                                }
                        }
                }
        }
```

5.2   Sample code of the application

A sample of the code of the view file "Conversation", with which we implemented our narrative manager, is displayed next. It contains the instructions for the view/event controller. We were able to choose what to display, when, under what conditions and with what restrictions for every scene in the game (viewDidLoad method). Several media files were included and synthesized for use. Also this short piece of code shows our implementation of databases (initWithQuestionId method), and the display of information with text labels. The tree structure of our feedback system can be appreciated, as we have multiple pointer arrays, with which we managed to move along the nodes depending on the story progress.

```
#import "conversation.h"
#import "amigoAppDelegate.h"
#import "endStory.h"
#import "myManager.h"
#import "store.h"
#import "selfTalk.h"
#import "actionscene.h"
#import "interstory.h"
#import "days.h"
#import "specialTeachCoach.h"


@implementation conversation

@synthesize Haruko1, Haruko2, Haruko3, Haruko4, Shou1, Shou2,
Shou3, Shou4, Henri1, Henri2, Henri3, Henri4, Momoka1,
Momoka2, Momoka3, Momoka4;
@synthesize Nishiwaseda, Classroom, Cafe2, Cafe, Bar, Pub,
Shimokita, Shimokita2, Takeshita;
@synthesize dialogueQuestionId, dialogueResponseId, backgroundId,
dialogueQuestion, dialogueResponseA, dialogueResponseB,
dialogueResponseC, dialogueResponseD;
@synthesize backToMain, refresh, questionLabel;
@synthesize responseA, responseB, responseC, responseD, playerConversation;
@synthesize Detective, Junpei, Kaori, Nami, Satoru, Charles, Miyuki;
@synthesize MemorialHall, Hospital, Police, Library, Garden,
Omotesando, HarukoRoom, ShouRoom, HenriRoom, MomokaRoom;
```

```objc
@synthesize Shibuya, UenoPark, UenoNight, ShibuyaNight, Haruna, Edogawa,
Bushido, Chiho, points;
@synthesize nombrePersonaje, Sportsroom;


-(id)initWithQuestionId:(int)qId responseId:(int)rId
dialogueQuestion:(NSString *)dQ backgroundId:(int)bId
responseA:(NSString *)rA responseB:(NSString *)rB
responseC:(NSString *)rC responseD:(NSString *)rD {
        self.dialogueQuestionId = qId;
        self.dialogueResponseId = rId;
        self.backgroundId = bId;
        self.dialogueQuestion = dQ;
        self.dialogueResponseA = rA;
        self.dialogueResponseB = rB;
        self.dialogueResponseC = rC;
        self.dialogueResponseD = rD;

        return self;
}

- (void)playSound {
        NSString *soundFilePath = [[NSBundle mainBundle] pathForResource:
        @"Flowers" ofType:@"mp3"];

        NSURL *fileURL = [[NSURL alloc] initFileURLWithPath:soundFilePath];

        AVAudioPlayer *newPlayer = [[AVAudioPlayer alloc]
        initWithContentsOfURL:fileURL       error:nil];

        [fileURL release];

        self.playerConversation = newPlayer;

        [newPlayer release];

        [self.playerConversation prepareToPlay];
        [self.playerConversation setVolume:1];
        [self.playerConversation play];
        return;
}

- (void)viewDidLoad {
    [super viewDidLoad];
        amigoAppDelegate *appDelegate = (amigoAppDelegate *)
        [[UIApplication sharedApplication] delegate];

        myManager *sharedManager = [myManager sharedManager];

        int elegido = (int)sharedManager.personajeElegido;
```

```
int opcion = (int) sharedManager.opcionElegida;

int orden = (int) sharedManager.siguiente;

int puntitos = (int) sharedManager.puntaje;

int next = 0;

next = orden - 1;

NSString *texto = [NSString stringWithFormat:@"%d",puntitos];

points.text = (@"%s",texto);

switch (elegido) {
        case 1: {
                conversation *converse;
                if (opcion == 1 || opcion == 0)
                        converse = (conversation *)
                        [appDelegate.dialogueQuestionsHaruko
                        objectAtIndex:next];
                if (opcion == 2)
                        converse = (conversation *)
                        [appDelegate.dialogueQuestionsHarukoB
                        objectAtIndex:next];
                if (opcion == 3)
                        converse = (conversation *)
                        [appDelegate.dialogueQuestionsHarukoC
                        objectAtIndex:next];
                if (opcion == 4)
                        converse = (conversation *)
                        [appDelegate.dialogueQuestionsHarukoD
                        objectAtIndex:next];
                questionLabel.text = (@"%s",converse.dialogueQuestion);
                responseA.text = (@"%s", converse.dialogueResponseA);
                responseB.text = (@"%s", converse.dialogueResponseB);
                responseC.text = (@"%s", converse.dialogueResponseC);
                responseD.text = (@"%s", converse.dialogueResponseD);
        if ((next == 0) || (next == 1) || (next == 2)) {
            Detective.hidden = NO;
            MemorialHall.hidden = NO;
        }
        else if ((next > 2) &&(next < 7)) {
            Haruko1.hidden = NO;
            Nishiwaseda.hidden = NO;
        }
        else if (((next > 6) && (next < 10)) || (next == 8)) {
            Kaori.hidden = NO;
```

```
                    Classroom.hidden = NO;
        }
        else if ((next > 9) &&(next < 16)) {
            Haruko1.hidden = NO;
            Cafe.hidden = NO;
        }
        else if ((next > 15) &&(next < 19)) {
            Haruna.hidden = NO;
            Shimokita.hidden = NO;
        }
        else if ((next > 18) &&(next < 22)) {
            Kaori.hidden = NO;
            Classroom.hidden = NO;
        }
        ...
    }
}
```

To favor programming, we created a new view class for every different setting. We contemplated the use of views for: 1) action scenes, 2) self meditation or talk scenes, 3) asking questions, 4) normal conversation, 5) story narration, 6) day counter, 7) puzzles, 8) virtual store, 9) registration, 10) log-in, 11) character load and 12) settings. Every view varied in the media elements they required. Initially we planned to have a different theme-song for each, however, given that we couldn't determine a minimum time per view, having too many clips made the transition between songs unpleasant. Our intention was to have a better organized control of our application, as it soon became obvious that order was necessary.

Making use of SQLite3 to access user and game data proved a complicated matter at the beginning, as iPads have a much more limited control of cache and a different use of garbage disposal than regular desktop or personal computers. This became harder specially when dealing with views that had to change their content fast continuously. From image sizing to file accessing, we had to learn through several mistakes that it is better prepare every element before uploading the application to the gadget. As we intend to upgrade our game to have server connectivity, we will continue studying the use of sockets and packet transmission through WiFi.

Chapter 6

Evaluation

Inspired by the requisites established on [15, 47] and the predictors of adherence to treatment [1, 16], to assess the success of prevention with Amigo, we conducted two experiments that included: 1) intensive interviewing, 2) questionnaires and surveys (all 5-scale Likert instruments), and 3) on-game performance estimation. These took place at a home-like environment, in an aim to avoid distractions and discomfort. Results were analyzed using textual analysis, theoretical coding, and theoretical sampling [8]. To evaluate the benefits of our Multiple Composite Scenarios (MCS) method, we conducted two sets of experiments, treatment and control. For the control group we kept all the multimedia elements of our Visual Novels for prevention (VNP), six out of the seven steps of the Multiple Composite Scenarios (MCS) except for the step "Inform", and our approach to persuasion (regulatory fit, affect framing and coping techniques). And for the treatment group we had our full Multiple Composite Scenarios (MCS) for Prevention on Visual Novels method.

Audience for the control group consisted of 9 students, 7 boys and 2 girls, 22.4 years average, with regular to bad eating habits (poor nutrition lacking vitamins, fiber, proteins, among others). For our treatment group we recruited 10 volunteers, 8 male and 2 female, average age of 22.5 years, from normal to bad eating habits. Participants came from the Departments of Information Science and Liberal Arts. Their eating habits were classified using an adaptation of the Eating Disorders Questionnaire (EDI) [10]. It should be noted that any of our participants had anorexia, we just decided to depict anorexia in our characters as a mean to persuade inspired by fear appeals [48]. That is, we go to the extremes by depicting the consequences of anorexia to an audience with regular to bad eating habits. Future work will consider the recruitment of patients with anorexia, or at least 50% female players, to analyze the benefits of our approach with a more delimited audience.

6.1 Materials

To successfully prevent we had to persuade players that their misconceptions regarding food, nutrition and their self-worth were wrong. We also had to educate them on the value of a good nutrition, and get them involved in the treatment of the patient, to give them opportunities for contextualized reflection, and to emotionally involve them in the process. In order to assess the success in our approach, we had to concentrate on the level of persuasion, what was learned and how it was learned, and the degree of involvement of the player. We were able to estimate the effect, strength and reach of our Multiple Composite Scenarios (MCS) method by measuring empathy, response to requests, quality of nutrition, knowledge, and intention to diet, as delimited on [10, 15, 29, 39, 47]. Thus, the steps of MCS (introduce, depict, inform, distract, evaluate, reflect and involve) gave us various opportunities to make calculations during game-play, as to prevent we had to persuade, educate and involve.

Empathy was calculated using concepts of presence, perception, trustworthiness and likeability as appears

on [27, 7, 12, 17, 18, 35]: with 5-scale Likert surveys, we asked questions like "Did you like the characters?", "Would you trust someone like the main character?", etc. It was obtained thanks to the steps of "introduce", "depict", "reflect" and "involve", as dialogues in the game were aimed at establishing an emotional relationship with the user. This goes in line with Arthur-Cameselle, and particularly Granek, who emphasized how the existence of a support net, people who constantly helped the patient address his or her misconceptions on food and self-worth, are key components in a successful recovery [1, 16]. Response to requests was estimated with each player's overall on-game performance, including puzzles, considering also the amount of secrets unlocked. This was possible thanks to the steps "distract" which consisted of action scenes where the main character had to fight the enemy and could win or lose depending on their current recovery, and "evaluate" where puzzles were used to measure user learning.

Quality of nutrition was rated by making a comparison in diets, before playing and after finishing the game. In order to increase the quality of their diet we used the steps of "inform", "evaluate" and "reflect", as we provided both interesting content on nutrition and opportunities to use and reflect on it. To evaluate the improvement in quality we handed a set of pictures to every participant, so they could give us a general idea of what they would eat in a 5-day period based on their regular weekly diet. We compared their choices with their results on the adapted Eating Disorders Questionnaire (EDI) questionnaires [10], the requirements for a healthy diet [39] and the criteria of the US Department of Agriculture [41]. We were looking for the presence or absence of recommended nutrients, like proteins, vitamins, carbohydrates, etc. The closer they were to the ideal, the higher the rating. If at least 50% of their choices showed improvement, they were considered as having a better quality of nutrition.

Knowledge was rated before and after play using a survey containing the basics on nutrition, and with our adaptation of Withers' five videotaped messages method [47]. Wither's method is closely related to the Unconscious Thought Theory (UTT) process: inform, distract and deliberate. Evaluation of Knowledge became easier thanks to the steps "inform", "distract" and "evaluate", with which we replicated UTT and Wither's methods. By estimating knowledge, we also covered the suggestions done by Arthur-Cameselle and Treasure who put nutrition, and learning about food among the top steps to full recovery [1, 39]. Lastly, intention to diet, following Withers suggestions, was obtained through 5-scale Likert surveys before and after play, with questions like "do you intend to go on a diet?", "have you been on a diet in the past year?", "has your diet changed in the last month?", among others. The steps "reflect" and "involve" were particularly helpful when trying to persuade users to actively change their eating habits, as these were composed of the scenes on which the lessons learned could be directly implemented in their virtual life, without all the complications present in the real world.

6.2   Methodology

Following Flynn's and Withers' recommendations to evaluate prevention, we divided our materials in different sessions, during a two week period, on which we made different samples to estimate our variables [15, 47]. On each, students were asked to play the game for as long as they wanted to. Average playtime (distributed in two sessions) for the control group was of 54 minutes, and 58 minutes for the treatment one. Empathy, and response to requests were measured at the end of every session. Tables 6.1 and 6.2 do not include information on the third session, that took place a week later, in which participants came for follow-up interviewing. As previously stated, to better understand the value of Multiple Composite Scenarios (MCS), we divided participants into treatment and control groups. We had a total of 19 students, 10 for Treatment (T), and 9 for Control (C). For both we calculated the mean and standard deviation of our dependent variables [47]. Sample 1 and 2 on table 6.1 stand for the different measurements we made in order to compare results. On the other hand, variables in table 6.2 required more than one measurement to be estimated.

6.2.1 Application

After being explained the rules of the game, and having created an user profile to save their game data, volunteers were handed Amigo, a headphone set to avoid external disturbance, and taken to a comfortable space. Participants from Treatment and Control group had similar average time of play (T= 58 and C= 54 minutes), yet distribution of time per player varied between the two. Students from the treatment group had a 29 minutes per session time of play. Nevertheless, in control group, time of play was very different between users.

One subject took over 37 minutes per session, as to him the gaming style was not familiar, while his peers ranked average under 25 minutes per session. When asked about it he answered "I have never played [Visual Novels], thus, it was hard for me to understand what to do", "also, the language used was a bit confusing. I didn't know what I should respond" he added. After interviews he noted that he does not play games regularly, and that the multiple options complicated to him the process of decision making: "I did not know what to choose at every moment. It took me time to think things twice, as I feared that I may be answering wrong". Other players did not show any specific problem regarding the option-selection gaming style.

From the control group, a volunteer rescheduled his second session and interviews nearly a week after the rest had finished due to personal reasons. His performance was not affected, and given the similarity of his results with those of his fellow group members we decided to include them in the final report. Due to time restrains, the oldest participant of the 19 (28 years old), also from control group, asked to finish the game in one session. His time of play was of 44 minutes. He was the one who showed the lowest scores in all measurements, and openly expressed his discontent with the game. More on his reasoning is included in the "Findings" section.

6.3 Results

Let us recapitulate: we were able to measure empathy, knowledge, response to requests, intention to diet and quality of nutrition to validate our approach. Empathy served us to understand the way in which volunteers related with the characters, situations and story, by estimating trust and presence, among others. Knowledge on 5 topics of nutrition was calculated before and after play, to assess the "education" element of prevention. Response to requests was evaluated through the different tasks and petitions on-game. Intention to diet was obtained through surveys and interviews, to determine if participants intended to go on a diet after playing the game. And quality of nutrition was evaluated by making comparisons in the weekly diet of the students before and after finishing the game.

		Sample 1		Sample 2	
		M	SD	M	SD
Empathy	T=	3.75	1.26	4	1.41
	C=	3.75	1.5	4	0.71
Knowledge	T=	2.25	2.47	4	0.71
	C=	1.5	2.12	3.25	0.36

Table 6.1: Results of the experiment

By measuring knowledge, intention to diet and quality of nutrition, we were able to check if Amigo managed to prevent. While empathy and response to requests helped us to get a scope on user engagement with the tool. Empathy was practically identical between Treatment (T) and Control (C) groups, improving 0.25 points (out of a 5-point Likert scale) in both cases. This trend was similar for the case of Knowledge. Participants on treatment (T) group, showed a positive increase (1.75 point) in knowledge after the second session, moving from an average of 2.25 out of 5 per student (Sample 1) to 4 by the second session. Volunteers

in Control (C) group also had a 1.75 increase on knowledge only by the second session moving from 1.5 to 3.5. While the difference in knowledge before starting to play was lower on the (C) condition, they also managed to learn. This is a good indicator that perhaps our gaming style, Visual Novels for Prevention (VNP): A) may have a future as a learning tool, and B) it successfully benefited players despite of their initial conditions.

From the total of 10 participants on (T), 90% obtained on average a "good ending" (based on the amount of points collected, options taken, and secrets found). 50% manifested a clear intention to diet, and 60% improved the quality of their nutrition. It was not the same for the control (C) group, with response to requests being 88%, intention to diet 55% and quality of nutrition underperforming by comparison with only 33%. Quality of nutrition was the only variable in which, (T) and (C) groups were not equally affected, as (C) did not include the step to "Inform". This could be a good indicator that Visual Novels for Prevention (VNP) are somewhat entertaining and engaging, and that the full Multiple Composite Scenarios (MCS) method contributes to the contextualized learning and decision making process. With the positive growth in empathy, knowledge, response to requests, intention to diet and quality of nutrition, we are able to assess that prevention was successful, in average, in 6 out of the 10 cases for the Treatment (T) group.

To strengthen our study, of the benefits of Multiple Composite Scenarios (MCS) for prevention, we conducted a series of follow-up interviews. With the results we developed categories, which gave us an overview of our data, as well as perspectives for improvement.

	Experiment
Response to requests	T = 90%
	C = 88%
Intention to diet	T = 50%
	C = 55%
Quality of nutrition	T = 60%
	C = 33%

Table 6.2: Rate of success of experiments

6.4 Findings

Hitting close to home

Participants who showed more empathy towards the main character, who could identify with the situations on the game, or who knew someone with a similar problem, felt more obliged to help the virtual character, and were also the most active in sharing perspectives and contributing in interviews. This could have happened because, to a certain degree, the game was a virtual representation of the world they interact with. By taking the risk factor of consequences out of the equation, they felt more motivated to take an active role. As one female participant assessed, "A previous roommate I had, acted like [character], she would hide and never eat". When asked to elaborate she said "I felt bad for her, she reminded me so much of my friend". One male volunteer, who had never met someone like that, said "I do not know anyone with anorexia, but, I felt so bad for [character] that I wanted to help", he then expanded by saying "I do volunteer work, so I like to help anyone with problems". Both cases reflected how empathy plays a decisive factor in prevention. As [18] points out, empathy grows with interactive stories, and other findings show that increased empathy with the source also influences user actions [26]. Without real consequences, whatever they did was okay, and perhaps they felt more capable of doing so, as common rules in collectivism [31], like inability to criticize or get too personal, did not apply.

Facing a wall

The reason why rejection arose, specially with a particular sub-group, was because they felt threatened by what the game presented. "I studied about [nutrition] in highschool, I knew it, but, I never liked it" said a boy who smokes and eats greasy food, he then continued "I don't have time for that, I eat what I want when I want, I just do not have time to care for that". One girl, who loves games and fast food, responded "It would be nice to have a good diet, and eat some vegetables and all, but, I really don't have the time, I eat what I can... and what I want". They were presented with hypothetic scenarios, like being handed easy-to-cook delicious cheap recipes, or good reasons why they should eat A or B, etc. The previous girl said "well, if it were easy, and maybe somebody recommended it, I may give it a try, but only if I like it". The oldest player of the control group, the one who asked for to finish the game in one session, also an avid player, answered with a very long face "yeah well, it may be whatever it may be, but, I do not like it, if I wanted to eat healthier I would, but I simply don't like to". When asked for a reason he said "I do not see any profit in dieting just to be thin, I eat what I like because I like it that way". Trying to get more reasons from him, we noticed discomfort, as if we were invading his privacy. This goes in line with what Miller and Silvia indicate [28, 34], that reactance to persuasion and disagreement is rooted in what could be regarded as threats to freedom and attacks to their person. That is, prevention was not possible whenever the scope of persuasion presented to the user an understanding of their self that somehow demerited them, like an insult, and whenever they felt obliged to act in a certain way. This category could serve as an outlook to explain why on [32], the opinion on Wii Fit went from 'loving it' to practically 'despising' the tool, as player's felt Wii Fit constantly ordered them to act in ways opposite to what they thought they should. And it is also a good explanation to why, in our case, persuasion failed with them, because as [45] explains, once subjects have made up their minds, unconscious thinking cannot easily change it.

Familiar faces

Having a new game with good looking characters and compelling stories helped us to obtain moderately good results. Nevertheless, the use of well-known characters and stories, those which the players are already familiar with, may be more influential. Following are some comments made to us during the interviews by one of the participants of the treatment group, who is an avid gamer: "I liked the game, but I prefer [popular game]", "I try to buy everything from [famous character], I definitely would do something if recommended by him just to try". "Usually I only play [popular game], I prefer characters in that game", said the oldest participant, from the control group, who also showed the lowest level in empathy. "I did not love the characters, they were okay" said another guy from treatment group, but then he elaborated "if they looked more like [famous cartoon] it would be better". His remarks came a bit off as a surprise to us, as he ranked above average in his group on empathy and persuasion. We did not receive complaints nor suggestions regarding character personality, background or actions. This is similar to what Tychsen suggested, who showed how popular characters, by having a personality, increased the level of the player's engagement and performance [40]. We intend to try our approach on a game that makes use of popular characters and story, in an aim to see the effects of Multiple Composite Scenarios (MCS) on multiple perspectives.

6.4.1 Lessons learned

To prevent using scenarios in a Visual Novel game may sound like a complicated task. This was not the case thanks to the use of our Multiple Composite Scenarios (MCS) permeated with the predictors of successful recovery (nutrition learning and self-worth reassessing), included in the steps: introduce, depict, inform, distract, evaluate, reflect and involve. While the use of opportunities to reflect is not new to persuasive games, we consider that it is the first time that contextualized learning and reflection on content is made available. At the beginning we were unsure on whether having a too complex methodology to introduce players to a topic would be counterproductive. However, as we confirmed through surveys and interviews,

more than half of the players had a good time playing Amigo, as all finished the game, 70% reported to like the gaming style, and 60% would play a part 2 if available.

This goes in line with Linehan's findings, that a game is considered as entertaining if it has the following factors: fun, flow, engagement, feedback, goals, problem solving, balance and pacing, interesting choices and a narrative [24]. All of which are present in Amigo. With Visual Novels, thanks to their multiple choice menus we were able to provide the fun, flow and feedback factors, as the user is at all times the drama manager. The Unconscious Thought Theory through its inform, distract and deliberate stages we were able to present players with goals, problem solving, had a good balancing and pacing, and interesting choices. And lastly, thanks to our Multiple Composite Scenarios we elaborated on the balancing and pacing, and provided a narrative which was fun and engaging.

We handed open questionnaires to the participants, on which we asked them if there were any areas or aspects of the game they particularly remembered, wether for bad or for good, as we wanted to know if anyone was just being nice at the interview and avoided making a harsh critique. Once we compiled the results we noticed that the few complains we had were related to certain aspects in the gaming style, which were due to bugs in the programming. The interaction with the characters was a player's favorite, as the 19 highlighted aspects of the conversations they liked. Bad comments were almost exclusively related to the style of the animation, except for one user who wanted a puzzle-based game. The majority expected professionally looking characters, and as could be expected, gamers (people who spend a lot of time playing video games) made the most suggestions.

Chapter 7

Related Work

Let us review the predecessors of our Visual Novels with Multiple Composite Scenarios (MCS) for Prevention approach. MCS is a gaming style that emphasizes user engagement with a story instead of multiple task completion. We make use of attractive characters, multibranching narrative, and persuasion to achieve prevention. While preventing through persuasion is something relatively new, using a game with attractive characters and a single-line story to persuade users to adopt a desirable behavior is not [15, 47]. Our method differs from carry-on gadgets in that we do not ask for personal user feedback on his or her health, we do not make use of sensors, as our gaming style is non-invasive, and we do not require the user to wear or carry any extra device for measurements [9]. Our work differs from awareness enabled aesthetic displays in that we use a narrative to emotionally involve the user, as opposed to social pressure and constant positive-negative reinforcement, we do not need the user to embed into his environment any sort of appliance, and we do not need constant reports [28]. iDetective differs from our application in that we do not use social comparison or constant goal-setting for persuasion, we encourage understanding and learning before evaluating progress, we do not make use of sensors, our rewards are not provided after completing physical tasks, we do not keep user attention by making multiple requests but rely on the enjoyment value of the story, and interaction with characters is our central scheme [49].

Persu is different in that it is a text-based application, our story is well-established and presented to the user from the beginning, our characters have personality and are not mere policy controllers, we do not rely on manipulation to persuade, and our game contains secrets, puzzles, multiple endings, and freedom of 'movement' through the virtual world [14]. Unlike Khaled et al, who evaluated performance based on the user's prior knowledge, we constantly inform, and encourage learning, we have a story in which, the type of puzzles or activities the user engages with depends on his or her actions, as opposed to a predefined set of tasks, and our characters show personal growth, like in novels [21]. Lo's team created a game for infants, to improve their nutritional habits while having fun [25]. However, our work differs from their tool in that ours contains a story, characters have a personality, user controls situations, and we do not rely on positive-negative reinforcement for progress. Last but not least, our work differs from Winchester's in that we do not make use of interventions, although our goal is to increase knowledge of the user and to prevent, we inform to later evaluate performance, and our approach is a game, while Winchester's suggested framework is a sort of online service [46]. Also, our characters, story and multimedia elements are at the service of the narration, to increase player interest, as opposed to using them only to inform. Our work differs from all in that we use Visual Novels to prevent, which to our knowledge remains an unused game scheme in persuasion, we have Multiple Composite Scenarios, and, except for [46], it differs from all in that our main goal is to stop a health condition from starting (or progressing), instead of dealing only with complications.

Chapter 8

Conclusions & Future Work

Throughout this work, we presented Amigo, a Visual Novel with Multiple Composite Scenarios (MCS), that uses Unconscious Thought Theory to prevent bad eating habits in young japanese scholars. Amigo is an application we designed by following experts' recommendations on the requirements for successful treatment adherence and recovery of a patient. We elaborated on the aspects of our tool and described its characteristics. We showed the evaluation and results, product of experiments we conducted among different sessions, and discussed our observations from further analysis of the outcomes. With Amigo, we prevent to a moderate degree bad eating habits from occurring (or progressing) by increasing knowledge, motivating participants to start a diet, and improved in half of the cases their quality of nutrition. We were able to do so while maintaining a good degree of empathy, and obtained a high degree of response to requests. We also elaborated on the technical features of Amigo, including a simple analysis of its code and added an algorithm to explain its functionality.

With our Multiple Composite Scenarios (MCS) methodology we provide a scope for contextualized reflection, taking into consideration the different stages in the development/progression of a health condition, and the requirements for full recovery: learning the value of food and replanting of the self-worth. We also introduced the novel Unconscious Thought Theory (UTT) approach to persuasion, with which we provided a method to balance persuasion-related content with the narrative of a game, without abruptly interrupting the flow of the story. We portrayed our use of the Visual Novels (VN) gaming style to shape the look and feel of Amigo. VN enabled us to have a multi-branching story, with which, we expanded from the initial goals. And we took particular care to illustrate the inner workings of our user- centered visual, narrative and interactive elements in the game. Prevention, as psychology suggests, allows to diminish or stop the progression of an affliction, specially if the people who tend to develop a condition may be helped to address their misconceptions. Thus, we believe that the benefits of the Unconscious Thought Theory (UTT), Visual Novels (VN) and Prevention to the HCI community should be studied more. We also believe that the adoption of the Multiple Composite Scenarios (MCS) method may help other researchers in the presentation of information on games.

For our future work we intend to evaluate the contribution that the use of famous characters and stories would represent to Amigo. We also attempt to develop new versions of the application considering all the suggestions given to us during usability tests and interviews, and to redesign the characters to make them more appealing to our audience. We also plan to study the implications to education of our methodology of Multiple Composite Scenarios (MCS) for prevention. Our aim is to try Visual Novels with Multiple Composite Scenarios (MCS) with other goals of prevention, including testing them on different hardware platforms. With at least two other examples, we may be in a better position to suggest a methodology, or even guideline, of use. We are also interested in studying the lessons learned and findings on the design and creation process of Visual Novels for Prevention (VNP). Having more examples and experience, we may be in a better position to make suggestions on the matter to those interested in our method and gaming style.

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